TELEPHONE ENGINEER

Vol. V CHICAGO, JANUARY, 1911 No. 1

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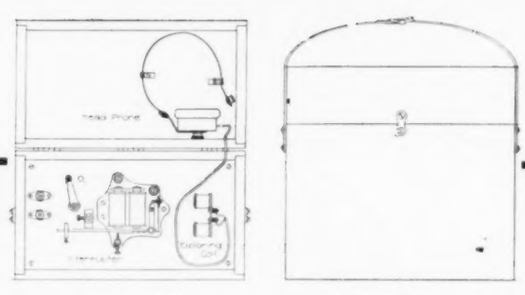

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Telephone Engineer

WITH WHICH IS CONSOLIDATED THE WESTERN TELEPHONE JOURNAL
ESTABLISHED 1902

VOL. V — CHICAGO, JANUARY, 1911 — NO. 1

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TABLE OF CONTENTS.

Editorial 1-4
Announcement of National Independent Telephone Convention..... 4
South Bend's New Exchange. By A. T. Irwin..... 5-7
Inter-State Shows Activity..... 7
Long Distance and the Transmitter. By Bela Gati..... 9-12
Decision on Inductive Interference..... 12
Getting Business by Telephone, 1. Special Service in Retail Stores..... 13
What One Woman Thinks. By Sarah Elizabeth Brown..... 15-17
Western Union Has New Telephone Method..... 17-18
Telephone Hearing Before Interstate Commission..... 18
Fire-Killed Pine and Spruce for Poles..... 18
The Scrap Book 19-24
Who's Who in the Telephone Game..... 25-26
Pennsylvania Hotel Pay Stations..... 26
The Canadian Independent Convention..... 26
The World's Progress in a Year. By W. H. Gunston..... 27-28
Digest of Foreign Telephone Literature..... 28-32
Development of the Industry. Extract from the Census Report..... 33-34
The Law and the Telephone. By E. J. Wenner..... 35-36
England to Own Telephones..... 36
Department of Railway Telephones..... 37-48
Rates and the Public. By C. L. Meyers..... 49-51
A Liquid Microphone. By F. J. Chambers..... 51-52
Of Interest to the Trade..... 53-57
- Book Reviews 53
- Improved Branch Exchange Switchboards..... 54
- Panel Boards and Cabinets..... 56
- Magnets Telephone Sets and Accessories..... 56
- Commercial Motor Car Show..... 56

Brevities of the Business..... 58-62

THE ASSOCIATION'S NEXT YEAR.

THE annual convention of the National Independent Telephone Association is the seventeenth, eighteenth and nineteenth of this month. The program outlined for the meeting appears on another page. It promises to be interesting, as usual. There is manifest an encouraging tendency to continue to develop the technical side of the convention, to offer opportunity for the engineer as well as the business manager.

But the thing more than usually important this year will be the selection of officers. The special importance of the election lies in the fact that the association is passing through, or rather just entering, a critical period. The undetermined jurisdiction of the Interstate Commerce Commission; the unheralded but impending formation of new state commissions; the necessary early solution of the old problem of physical connection of systems; the Morgan-Bell "situation," and a host of lesser, but still important questions, demand of the association a degree of watchfulness unneeded even in the strenuous days of a decade ago.

The association is now in good hands. President Frank Woods has given to its affairs a vast amount of a busy man's time. He has accomplished more than most men could do with their undivided service. He is master of all those live issues which will occupy the attention of the telephone field during the next year. He is known and reckoned a power by those who have to do with the making of laws affecting the industry. He is a man with the courage of his convictions, an intimate knowledge of the business that makes his convictions right, and the force to carry them over all obstacles.

We do not know that Mr. Woods is willing to be president for another year. Men of high efficiency usually find more substantial reward in fields of effort other than association work. But we must needs be selfish in selecting our leaders. If the man does not need the association, the association needs the man.

J. B. Ware, the association's secretary, is competent, popular and universally known. He has been engaged in the work of the association so long it is difficult to conceive of another in his place.

Re-elect Frank H. Woods president and J. B. Ware secretary of the National Independent Telephone Association.

START THE NEW YEAR RIGHT.

SOME men, whether employers or employees, seem to have the faculty of being always happy in their work. But it is to be feared that the majority of workers in any field are not entirely content with the personal results of their efforts. The efficiency of the

employee particularly is hampered frequently by a number of beliefs, or half conscious theories, which go to make up his attitude toward life. If he is of the kind ordinarily considered ambitious it is more than probable that these ambitions take the form of an inordinate desire for money. The desire, perhaps, is excusable in this day; but almost inevitably it leads to the belief that he is underpaid, and that belief reacts both on his efficiency and his happiness. On the other hand, if his ambition takes the form of actual executive zeal he is apt to feel, at least occasionally, that his efforts are not appreciated by his employers; or if he concedes that appreciation, his analysis may be too limited to reveal to him the possibility of promotion. These beliefs do not necessarily indicate deficiency in character. They show only a wrong conception of life, which there is a possibility of righting.

Then there is another class of employes who are not ambitious. They lack enthusiasm either because the only goal toward which their present efforts are directed does not seem so attractive as the ideal, or because they have lost their ideal and their false conception of life has become chronic.

Telephone engineering is an extremely broad field, and every telephone worker is potentially an engineer. If he is not immediately recognized as such perhaps the reason lies in his own too limited conception of the profession and its requisite mental equipment. Development in it necessitates far more than the mere technical ability to do things. It is not too much to say that the worker should make a part of his mental equipment, all the facts which have been recorded by other workers in his field. He must eventually do more than this; he must learn to associate facts and to draw new conclusions from their association. Upon the humble basis of the correlation of known facts rest the most clever of original investigations, the most brilliant inventions. The facts themselves are easy of access. Books have been written, trade papers are being published, solely for that purpose. But they cannot make the worker use the facts they present. He himself must take his ambition from its dreaming and put it to work to organize a system for his development.

That is the technical aspect of the subject, and it is only one-half of the whole. Eventually the worker, whether he will or no, must undertake the most complex of all studies, the study of men. He must study himself, his fellow workers, and his employers. Every employee has formulated in his mind an ideal employer. Let him then conceive an ideal employee and measure himself against that standard. The old recipe, "Put yourself in his place," if consistently followed, will do more to correct a false attitude towards life than a thousand philosophies.

And after all, the worker should remember that engineering is not all of an engineer's life. The field is as broad as the world, and he must be a broad man who can fill it. He must be able to meet other men upon common ground, whatever their philosophy. The big man in any field is essentially human, with human likes and dislikes and a lively knowledge of what other humans are doing.

The moral of all this is that unless you like your work; unless there is something in it which impels you to pursue it regardless of remuneration, which makes you want to know all there is to learn about it, which makes you feel a fellowship for all others engaged in it, you cannot find success.

This is the season for taking stock. Look yourself over and see if the constituent parts of the service which is making your life work are calculated to give the best possible product. Your physical and mental self are the plant whose operations must pay you dividends in success and happiness. Guard against personal inefficiency, inadequacy and obsolescence by establishing a fund of knowledge and self-confidence ample to meet all possible contingencies.

Money value is the measure of success today, and you can gain that success in either of two ways. You can be a slave to your profession, or you can make your profession a slave to you. There is no half-way course, and only one of the ways will bring you the true success of happiness. Make your choice.

THE DREAD OF LONG DISTANCE.

"A SLAVE to the telephone," is what the editor of a New York paper called E. H. Harriman. For the late railroad magnate was one of the comparatively few, even in the telephone age, who appreciate to the full extent the commercial value of that institution. He was never out of reach of an instrument, whether in his bath, at his bedside, or on his dining table. Even when he went into the wilderness the telephone must be there. "A slave to the telephone." And when he heard that, he said, "Nonsense! The telephone is a slave to me!"

No doubt when Mr. Harriman had occasion to talk to Chicago from his New York office he took up his receiver and talked with the same aplomb as when he used an intercommunicating set. And, no doubt, in this he gained an advantage over his auditor at the other end of the line, who probably was less at ease and consequently less inclined to aggression.

For it is not yet given to most men to participate in a long distance telephone conversation with any degree of *sang froid*. Whether it is a dread of the unfamiliar, a fear of unsatisfactory results, or an awe of the sheer remoteness suggested by the very name of another city, the fact is that the average man shrinks from receiving, and dreads to originate, a long distance call.

We have no intention of pondering the psychology of this phenomenon, although, doubtless, it is very simple. But we do insist that it should receive profound consideration by telephone engineers. There used to be people who dreaded riding on railroads, and the attitude of most women toward telegrams is still a subject of comment. The railroads have cured the prejudice by making their service attractive. In some other countries the telegram lacks its sinister significance because its use has been made absurdly easy and convenient, so that it is as common as the picture post card. In Mexico, for example, one buys a card for five cents, writes a message, and drops it in a box; whence it is collected and transmitted by wire, to be delivered a few minutes later transcribed on a similar card. The Mexican women do not dread the telegram.

Yet the telephone companies have striven earnestly to make long distance telephoning as attractive as possible. Their engineers have devoted years to perfecting voice transmission over long lines. Their operators are trained to give all possible assistance at both ends of the connection and to bear all the burden

of finding and capturing the called party. All the originator of the call has to do is name his desires. As this apparently ideal arrangement has not served to remove the dread, something more is evidently necessary.

Of course the present long distance telephone traffic of the country is really tremendous. But this is a tremendous country, and its telephone possibilities are so far ahead of its actualities as to make the latter seem poor indeed. And they will be poor so long as the average man dreads the long distance call. That the dread really exists needs little observation to confirm.

What the cure for this condition is we will not pretend to suggest at this time. Perhaps some of our readers have ideas on the subject. If so, we would be glad to hear them.

SLEET STORMS.

EXPERIENCE is a dear teacher, but it seems to be the only means calculated to bring home to some telephone operators the serious nature of the annual ravages of sleet storms in this country. A recent press clipping from Ellicott City, Maryland, states that the Citizen's Telephone Company of Howard county, that state, decided to give up its charter November 1 and go out of existence. The primary reason for the company's failure lay in the severe wind storm and heavy sleet storm of March, 1908, which nearly put them out of business. The necessary repairs drew too heavily upon its treasury. The bondholders were obliged to foreclose and do what they could with the property. The average telephone operator, despite the evidence of his own eyesight does not believe that sleet storms are very prevalent. If his construction is good and stands up without apparent injury under his first, or second, or maybe third sleet storm, he becomes familiar enough with the visitation to treat it with some contempt. Since it has not damaged his property he may not even recognize it as a sleet storm, at least in its technical sense. So he lets his poles and cross arms and lines deteriorate a little more, allowing probably a sufficient amount for ordinary depreciation, but making little or no provision against the possible destruction which appears so improbable.

Mr. Frank F. Fowle not long ago prepared some very interesting data on sleet loads and wind velocity, which were published in the *Electrical World*. His observations, based on a study covering a period of ten years, seem to indicate that sleet storms of a serious character have an average occurrence of about twice a year, and heavy sleet storms appear almost once a year. The maximum sleet precipitation recorded during the year was nearly 2½ inches, and it was accompanied by a maximum wind velocity of 53 miles per hour. He finds that sleet precipitation of at least one inch may be expected occasionally, and of half an inch quite frequently. A particularly noteworthy condition is that following a sleet storm it may happen that the temperature falls, or the wind rises, or both, or there may be a precipitation of heavy, wet snow following the sleet. Thus, while the maximum recorded wind velocity during a sleet storm was 60 miles per hour, an extreme wind velocity of 86 miles per hour was observed following one heavy storm, and accompanied by a falling thermometer. The importance of these observations lies in the fact that one must reckon with the conditions that follow a storm as well as with the storm itself. Heavy precipitation of sleet upon wire may strain it almost to the breaking point. If this were all, recovery might be possible; but follow the sleet with a high wind, causing additional strain and oscillation, and a falling temperature which causes the sleet to remain instead of melting away and the chances for disaster to the system were greatly augmented. While ordinarily the wind pressure upon open wires is not great, it will be observed that the area of exposed surface of the wire is increased enormously by even a small coating of sleet; and when we consider that in Mr. Fowle's own experience he has encountered sleet deposits two inches in diameter, we can appreciate the grave nature of the situation.

In a theoretical discussion Mr. Fowle calculates that with the great dissipation noted, which reached two and a half inches, the sleet diameter on the wires would reach a possible maximum of 2.87 inches. While such an enormous formation of ice is well nigh inconceivable to most of us, readers of TELEPHONE ENGINEER will recollect that last May we printed photographs showing a thickness of sleet on wires which must have reached over two inches.

To intelligent operators it is unnecessary to give directions for forestalling sleet storms. Every manager worthy the name can guard against such a visitation. The thing is to make him appreciate the seriousness of the proposition and awaken in him a realizing sense that his own plant may be the next one to suffer.

THE CAMPAIGN FOR TELEPHONE COURTESY.

OVER a year ago TELEPHONE ENGINEER opened a campaign for telephone courtesy by offering $100 in prizes for articles or essays best calculated to awake interest in the subject. That the time was right for such a campaign has been amply proven since then. One of the prize winning essays, written by Frank J. Wisse, has received, and still is receiving, an extraordinary amount of publicity. It has been reprinted in whole or in part by newspapers innumerable. It has formed a basis for discussions before many clubs and societies. Best of all, it has been reproduced in the telephone directories of hundreds of operating companies where every day telephone users cannot fail to see it and to benefit by its reading.

It is not our purpose to reprint any part of Mr. Wisse's essay in an unnecessary effort to add force to these comments. Those who are not familiar with it may find it in TELEPHONE ENGINEER for January, 1910. But while many of the newspapers have reproduced the article, they have done so without extended comment, others have added their own versions of the situation; perhaps their own suggestions for a cure for the ills of telephone courtesy. It is worth noting that it is the better class of papers which are giving space to these questions and they are doing a splendid work. It is within the observation of every one that the methods of telephone expression have improved tremendously since the first appearance of Mr. Wisse's article in TELEPHONE ENGINEER. It is but fair to express our deep appreciation of the public spirit and fine discernment of those newspapers which are taking up the campaign that we started. The trade paper is essentially a specialist and can do little with the great lay public. But the general newspaper press is tre-

mendous in its power and when that power is used to right a wrong the whole world is benefited.

As an illustration of the form of publicity which the problem of telephone courtesy is receiving in the better class newspapers, the Philadelphia *North American*, after reproducing Mr. Wisse's article in its columns, goes on to say:

These words are timely and to the point. At this late day there is no excuse for harsh or impatient telephone manners. The telephone, although it is such an absolute necessity nowadays, is of comparatively modern birth. The lack of courtesy in its usage is a relic of the time when the telephone service had not reached the perfection of today, and there was some excuse for losing one's temper. Clear, pleasant, deliberate telephone talk should be the order of the day.

Many firms have specially instructed their employees to answer with their names or departments, or whatever other identification will immediately signify that the right person has been reached.

The great development in telephone buying accentuates the necessity of facilitating telephone orders as much as possible. The department stores especially have recognized this, and now one is almost uniformly greeted with the name of the store by the private branch exchange operators, and with the name of the department by the salespeople.

Any word about telephone manners would be incomplete without a mention of the operator. Many folks who are otherwise perfectly kind and considerate forget to be so to these much-maligned young women. As a class, operators are highly trained and competent women. They must answer many calls a day from impatient and unreasonable persons, as well as from many who are quiet and considerate, but their equanimity seems to be unimpaired, and they go on patiently answering, "number, please," in a pleasant voice.

Many people would be surprised and horrified could they hear their own words and tone of voice over the telephone. It is a question, too, whether most of us could keep our tempers or answer as patiently as do the operators under such treatment.

We are all human, telephone operators and telephone users as well. With the spoken word and the tone of voice as the only means of conveying whatever impression one gets of the other, it is necessary to be polite. Courtesy and consideration are the oils which lubricate the machinery of a telephone conversation and prevent friction to a marked degree.

A great deal would be accomplished if the influence of the Philadelphia paper had stopped there, but as a matter of fact the whole article has been reproduced in many other papers throughout the country, being credited to the *North American*. When we stop to think of the tremendous circulation which this timely attack on telephone discourteousness has attained in this manner, we feel inclined to predict that the day of the telephone millenium cannot be far distant. And by telephone millenium we mean the day when people will talk to each other just as well over the telephone as they do face to face. As a nation we are polite, mild and courteous, in spite of occasional dissertation to the contrary. Thanks largely to Mr. Wisse's article, we are beginning to achieve grace in that direction even over the telephone.

OMAHA'S ACTIVITY.

PERMISSION to raise more than $100,000 to extend the independent telephone lines in Omaha and South Omaha was asked of Judge T. C. Munger in the federal court at Lincoln, Neb.

Lysle Abbot, receiver for the company, asked that the company be allowed to sell receiver's certificates aggregating more than $100,000, stating that he believed the market could be easily found.

The object is to establish more exchanges and telephones and wire a number of new buildings in course of construction.

National Independent Telephone Convention

LA SALLE HOTEL, CHICAGO, ILLINOIS

January 17, 18, 19, 1911

MONDAY, JANUARY SIXTEENTH.

Preliminary meetings of Committees, Advisory Board and the Board of Directors.

TUESDAY A. M., JANUARY SEVENTEENTH.

Welcome by Mayor.
Response.
President's Address.
Secretary-Treasurer's Report.
Technical Conference Plans—Mr. L. E. Hurtz.
Appointment of Committees, etc.

TUESDAY P. M., JANUARY SEVENTEENTH.

Technical Conference—Mr. L. E. Hurtz.

WEDNESDAY, JANUARY EIGHTEENTH.

Insurance—Fire and Income.
Utility Commission—General.
Legal Aspects and Trend of Events.
1. Rates—Uniform Schedules Established.
   (a) Authority to fix minimum rates, and
   (b) Prevent discrimination in rates and service.
2. Compulsory Interchange in Service.
   (a) By Toll Line.
      (1) With competing exchanges.
      (2) With non-competing exchanges
   (b) Between Competing Exchanges
      (1) Compensation and Results.
      (2) Conditions and regulations.
3. Parasite Companies—how prevent.
   (a) How prevent or
   (b) How regulate.
4. Effect of Regulation on Telephone Business.
   (a) Wisconsin.
   (b) South Dakota.
   (c) New York.
   (d) Nebraska.
   (e) Other States.

Committee Reports.

WEDNESDAY P. M., JANUARY EIGHTEENTH.

Technical Conference.

WEDNESDAY EVENING.

Banquet.

THURSDAY A. M., JANUARY NINETEENTH.

Financing of Telephone Companies, by B. G. Hubbell, Buffalo, N. Y.
Discussion led by Mr. E. H. Moulton, Minneapolis, Minn., and Mr. E. B. Fisher, Grand Rapids, Mich.
Report of Committees.
Election of Directors.
Unfinished Business.
Adjournment.

South Bend's New Exchange

By A. T. Irwin

SOME features in switchboard construction new to the art in this part of the country are contained in the new Bell exchange at South Bend, Indiana, just cut into service by the Central Union Telephone Company.

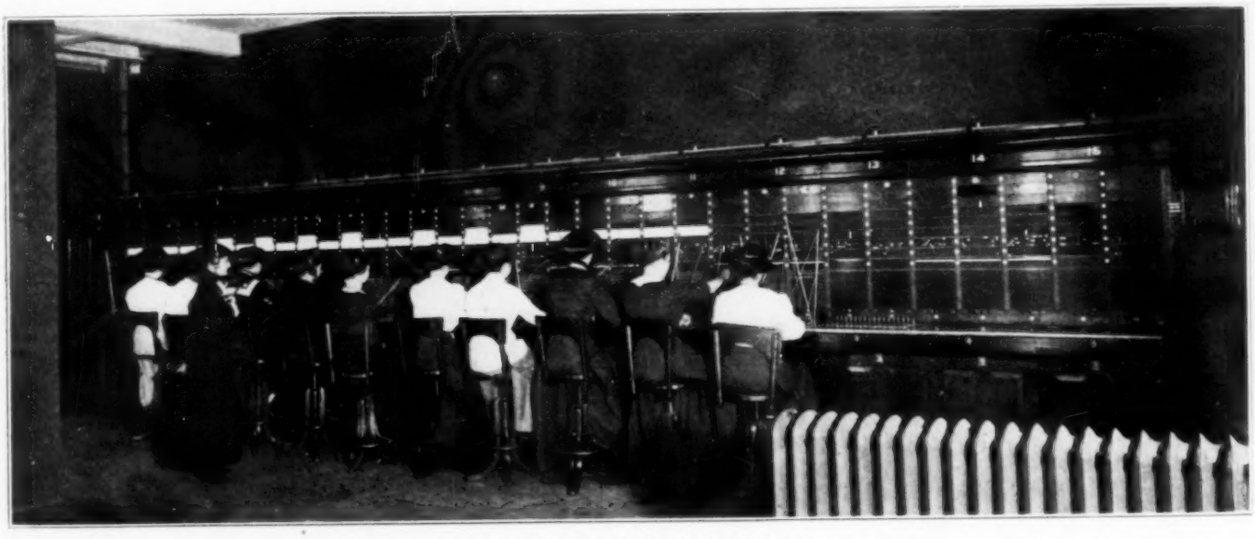
The new South Bend equipment was installed in a new building completed last year by the Central Union Company. The building is three stories and basement, fireproof throughout. In addition to the exchange, the building is the home of the district organization for northern Indiana.

South Bend's New Exchange Building.

The subscriber's switchboard at South Bend is very similar to the Western Electric No. 1 relay multiple switchboard and is equipped with many of the standard circuits. The subscriber's cord circuit, however, which is the actual connecting link between subscribers during conversation, is equipped with automatic listening and ringing, the purpose of which is to reduce to a minimum the number of regular manipulations required of the operator in answering calls and completing connections.

By means of the automatic listening feature the operator's telephone is automatically connected to the answering cord, which she selects to answer a subscriber's lamp, after a cord has been inserted in the answering jack. Immediately upon placing the calling cord of the same pair into the multiple jack of the line called for, the operator's telephone is automatically disconnected from the cord circuit without any attention on the part of the operator and the automatic ringing comes into action, causing the telephone bell at the premises of the called subscriber to ring in periods of two seconds with intervals of four seconds silence. During the ringing period a tone resembling the subdued ringing of a muffled telephone bell is carried out from the central office to the ear of the waiting subscriber at the other end of the connection. This is an indication to him that the bell of the telephone with which he wishes to talk is being surely and faithfully rung and he may await a response as long as he feels justified in so doing.

Immediately upon removal of the receiver from the hook the ringing ceases and the connection is in readiness for the conversation. In the event the subscriber called does not respond and the calling subscriber



The Local Switchboard, South Bend, Indiana.

abandons the connection, the disconnect signal appears before the operator and the connection is taken down.

Five sections of subscriber's switchboard, located in a well lighted operating room on the second floor of the Telephone building, comprise the present installation. Each section carries equipment for three operators' positions. The county and farmer lines are also handled at positions on the subscriber's switchboard. One position is equipped for toll-to-local switching and one as a switchboard testing position from which tests of trouble in the switchboard can readily be made. The "howler" tone is also available for use from this position and can be used by the chief operator or supervisor in calling the attention of a subscriber to the fact that his telephone has been left off the hook.

Five sections of Western Electric No. 1 toll board and two additional recording positions comprise the toll line switchboard equipment. The recording lines appear also before a toll line operator and can be handled at that point at night or during other periods of light load. A large amount of A. T. & T. toll business is handled at this point in addition to that carried over Central

The Toll Board.

Union lines and ample toll facilities have been provided to take care of this end of the business.

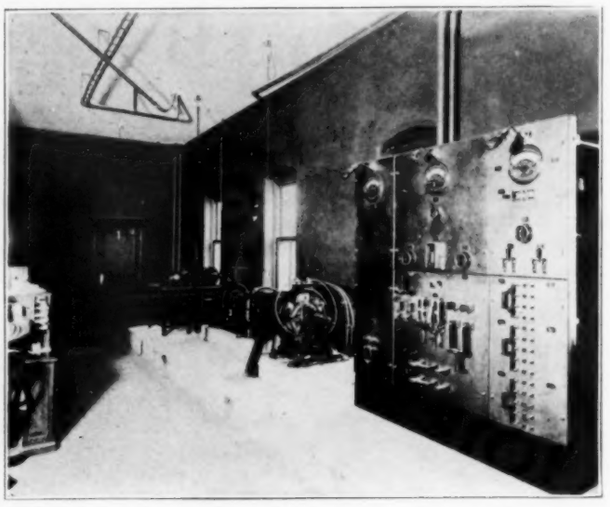
In addition to the switchboard described, wire chief and chief operators' desks and the usual distributing frames, relay racks, coil racks and fuse boards are provided.

A combination main and intermediate distributing frame and relay rack is located on the third floor in a room adjacent to the toll operating room. This carries toll equipment only and is separate and distinct from those on the first floor carrying local line equipment.

A toll wire chief's desk designed to accommodate the A. T. & T. and Central Union toll lines with all of the necessary simplex and composite equipment and provided with circuits and instruments for determining the nature and location of toll line trouble is installed in the apparatus room on the first floor.

The local wire chief's desk is also located in the apparatus room in close proximity to the distributing frames and racks and within sight of all power machines and the power board.

Two sources of power are used for driving the



The Power Plant.

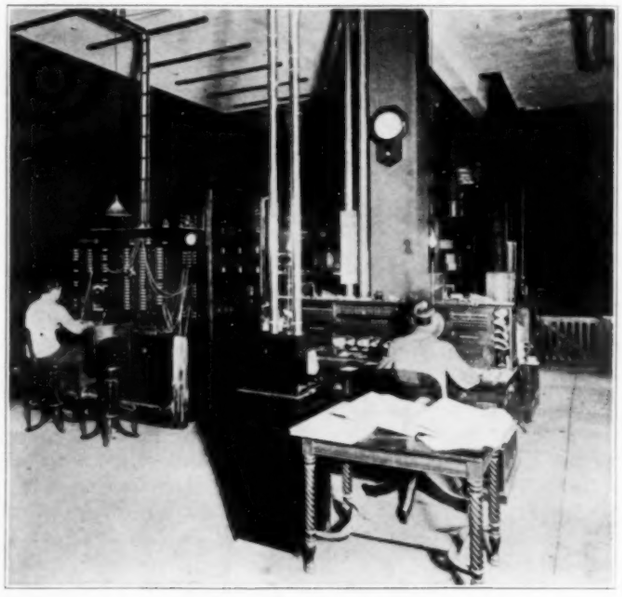
battery-charging generators. One is a motor running on alternating current derived from the electric company's power leads, and direct-coupled to a Western Electric thirty-volt generator. The second source of power is a nine horse-power White and Middleton gas engine located in the basement and operating on artificial coal gas. Passing through the first floor is a leather belt which applies the power developed by the gas engine to a western Electric generator mounted on a concrete pier on the first floor. The capacity of this set is 175 amperes at a pressure of 30 volts.

Suitable switches and instruments are mounted on the power board on the first floor for controlling all power machines, including the ringing generators which are equipped with interrupters of a recent design, rotary in motion, and driven by mechanical connection to the shaft of the ringing generators. The "tones" and interrupted currents which play so important a part in the modern telephone exchange and the intermittent ringing current which causes the telephone bell to ring at regular intervals with clock-like precision are controlled by the interrupters.

Public Office and Pay Stations.

Duplicate ringing generators, each with its individual set of interrupters and each driven from different sources of power are provided in order that the possibility of being without the use of such equipment be reduced to a minimum if not entirely obviated.

A novel piece of equipment is the pneumatic ticket carrier arranged to carry trouble tickets from the local and toll chief operators' desks to the wire chief's desk. A neat mahogany finished cabinet containing a foot-operated bellows is located at the local chief operator's desk on the second floor and a similar one is adjacent to the toll chief operator's desk on the third floor. Trouble tickets are enclosed in small cylindrical carriers and sent to the wire chief's desk from either cabinet. The carriers are driven through a round brass tube two and one-quarter inches in diameter by compressed air supplied from the bellows by one operation of a foot treadle. A cabinet is located at the wire chief's desk into which the carriers are deposited from the conveying tube. This latter cabinet is also designed as a sending station from which the carriers are returned to the chief operators' desks.



Long Distance and Local Test Boards.

The storage battery equipment of this installation is located in the basement in a well lighted and ventilated battery room. The function of the storage battery is to absorb all electrical current in excess of that required to operate the entire system during the hours that the charging generator is running and convert it into chemical energy to be again given out to the system in the form of electrical energy during the remainder of the day and night after the charging generator is shut down. Two chloride accumulator batteries, each consisting of eleven cells, comprise the storage battery equipment and the customary pressure of twenty-four volts is maintained for local signaling and transmission and a forty-eight volt pressure is sustained for long distance transmission.

Offices of the local manager, including the collector's desk and cashier's cage and a conveniently arranged public pay station, occupy the front portion of the first floor of the building.

The district superintendent and his corps of assistants are situated in commodious offices on the third floor.

Large and convenient quarters, suitably arranged and neatly furnished are provided for the operators, including a cheerful rest room where spare moments can be spent.

Ample space is provided for individual sanitary steel lockers, and a modern kitchen, fitted with the necessary conveniences and stocked with the required dishes and utensils, is maintained.

November 1, the Bell company announced a schedule of discounts from the established rates, to remain effective until the exchange reaches 5,000 telephones.

John L. Putnam is district superintendent for the Bell company at South Bend, and Edgar T. Bonds local manager.

Inter-State Shows Activity

Since the Inter-State Telephone and Telegraph Company of Illinois, passed into the hands of receivers it has shown more real activity than in years past. The strategic position of the company in the field it serves assures strong efforts to set it on its feet again. The company's hope lies in a connection for its long distance lines with the local system of the Illinois Tunnel Company at Chicago. The following appeal has been issued by the secretary of the company:

TO TELEPHONE USERS IN CHICAGO AND THROUGHOUT THE STATE OF ILLINOIS:

The telephone monopoly of the "Bell system" had the business interests of Illinois at its mercy when the Inter-State entered the fight ten years ago. No argument is needed to prove to our subscribers that rates are lower and service better than before we entered the field.

During these many years those who have stood so loyally by us have looked forward to the time when they could talk with their friends and business connections in Chicago over independent lines. Upon the eve of a realization of this long cherished dream former officials of the Inter-State, for reasons of their own, endeavored to sell and deliver the company and its subscribers to the Bell interests. Through treachery and diversion of funds the October interest on our bonded indebtedness was defaulted in order to give those who believed they controlled the company a chance to foreclose the bonds and buy in our property at their own price. Fortunately the strong arm of the United States Circuit Court reached out and blocked that method of confiscation.

The appointment of the receivers for the Inter-State was to conserve the property and pay the interest on our bonds. Conserving the property as interpreted by the receivers does not contemplate making any new contracts except those incident to the operation of the routine business. I entertain a very different view of their duty to the owners of this company and their relation to its patrons and to the public,—hence the issuance of this statement.

The lines of the Inter-State are at the Chicago city limits at 46th avenue and West 22nd street. The automatic telephone system of the Illinois Tunnel Company could, with a few days' work, be extended to that point, so as to connect with us and give Chicago immediate connection with all of our subscribers and those of other independent companies operating in more distant sections of the country.

There are over 1,300,000 independent telephone users within a radius of five hundred miles of Chicago who cannot at present reach Chicago. Commercial interests of your city are unable to reach by telephone an army of buyers and sellers who are easily reached from all other large cities in the Central West.

The Inter-State has, at an expense of many millions of dollars, built up a telephone system which embraces 1,567 miles of modern toll lines in central and northern Illinois. It has a trunk line connecting Springfield, Peoria, Joliet, Aurora and

Elgin with exchanges in operation at each of these cities and many of the smaller cities and towns between these points. We have another trunk line from St. John, Indiana, running parallel with the southerly boundary of Cook county and in a westerly direction to Clinton, Iowa, which affords connection with all of our exchanges in the northern and western parts of Illinois.

In Kane, DuPage and Will counties the Inter-State has over 10,000 bona-fide subscribers who at the present time are unable to talk with Chicago. We actually reach or connect with 1,234 cities and towns in the state of Illinois which have over 300,000 independent telephones in daily use. The Inter-State Company has its lines to the Chicago city limits, and is ready, willing and anxious to connect with the lines of the Illinois Tunnel Company if they will only meet us from their side of the city line.

If you are in favor of the immediate connection between the Inter-State Company and the Illinois Tunnel Company, please write a strong letter to the receivers of each company, sending copies of your letters to me, in order that I may be able to turn them over to the Illinois Manufacturers' Association, or such other organization as may be willing to take official notice of the matter. The receivers and their addresses are as follows:

Charles G. Dawes and David R. Forgan, receivers, Illinois Tunnel Company, 152 Monroe street, Chicago.

William C. Niblick, Fred A. Dolph and Sanford W. Ladd, receivers, Inter-State Independent Telephone & Telegraph Company, 100 Washington street, Chicago.

In addition to your own letters direct to the receivers, please see if you cannot secure the co-operation of any commercial clubs or trade organizations to which you may belong. Such bodies often accomplish much good for their members by taking an active part in affairs of this kind.

As to my interest in bringing this matter to your notice, will say that for many years I have been a member of the board of directors and a member of the executive committee of the Inter-State Company, and shortly before the appointment of the receivers was elected secretary. While I have never been active in the management, I feel a certain responsibility to the investors in our securities, to our subscribers and to the public.

Many of the cities and counties granting franchises to the Inter-State Independent Telephone & Telegraph Company did so upon the solicitation of local commercial associations with the understanding that we would give them a Chicago connection at the earliest possible date. I feel it my duty to announce to the public that the responsibility for immediate telephone connection between independent users in Chicago and those outside rests with the receivers of the two companies named.—Adam S. Clow.

The interest on the bonds of the Interstate Company, which was defaulted on October 1, is to be paid. Fred A. Dolph, receiver of the company, states the company has on hand in cash $43,000 and a large amount of collectible accounts receivable, out of which there is little doubt that the $59,750 interest due on the bonds will be met before foreclosure proceedings would be in order. Of the accounts receivable there is said to be $65,000, toward the collection of which little effort has been made.

The company's inability to pay the bond interest when due is blamed to mismanagement. With the present instruments in service the gross income should have been $400,000 for twelve months, it is estimated. Allowing 55 per cent for operating expenses, there would be net earnings of $180,00—a sum sufficient to pay all charges and leave a surplus of $45,000. The company has unfilled applications on file for about 4,000 telephones.

A Plea for the Operator

When the "girlie" at "Central" says "busy," don't let yourself be worked into a fret and a sweat; don't tell her in language all freckled with fire, you think her a quite near approach to a liar. Don't paw at the carpet, and don't chew the rag, nor roar as a bull when it sees a red flag, nor tell her in voicing that paints the air red, you'll have her tin-canned ere the sun goes to bed, but murmur in sugary, marshmallow words, 'twill fall on her ear as the carol of birds, to please ring you up when the line is at rest, and she raises the party of whom you're in quest, and when she replies she will do so, just hang the receiver up gently and not with a bang. You scolding old fellow, if you had to bear but half of the hello's girl's burden of care, that temper of yours would explode with a boom; 'twould scatter oath fragments all over the room. They often are cussed at and growled at by men when trying to do just the best that they can to keep service moving along without hitch, when soreheads believe them asleep at the switch, and sometimes the harsh words which fall on their ears fill their throats full of lumps and their eyes full of tears. Just do unto them as you'd have others do unto a sister of yours were she one of the crew, and you'll find that your services far better will be than if by your crossness you rattled them, see? And all of the girls will pronounce you a dear, instead of an ill-tempered, sore-headed bear. Just give it a try, and if our words lack in truth you can boot us to Brighton and back.—James Barton Adams, in the *Denver Times*

Telephone Schools Teach Voice Culture

Some of the schools of operating conducted by telephone companies are devoting a great deal of attention to voice culture. In one large Western city, which claims a larger percentage of telephone users to its population than any other city in the world, twenty-five new pupils assembled at such a school and were met by a woman teacher, whose "Good morning" caused twenty-five pairs of eyes to open wide in astonishment. The greeting was a trill, rather than a speech. Each syllable had a separate and distinct note. The modulated phrase imparted the key to what the instructor intended to teach the class. As her plan was unfolded, the girls grinned foolishly at one another, each wondering whether she had made a mistake and wandered into a training school for operatic singers.

To the ordinary individual it is easy enough to say, "Number, please?", "Are you waiting?" "Six-seven-four," and kindred words. But some of those girls tried it for days before they came anywhere near satisfying their instructor. The veriest baby in the kindergarten can count up to 10, but when most of those unlucky pupils reached 4, they were stopped with "That's all wrong. Please begin again." And then followed a sample of "how," in the teacher's melodious voice, a sample of inflections and deflections, like mounting the scale part of the way, coming down a little, going back up, and culminating in a note which would have done credit to an operatic star.

"When I have finished with this class," announced the teacher, "it will be in such condition that no member of it, however long she works at the switchboard, will get back into the flat, dull automatic speech of the present-day operator."

Long Distance and the Transmitter

By Bela Gati*

THE examination of the vowels of our language has occupied phoneticians for more than ten years. The tests made permit us at present to believe with certainty that the vowels arise from the simultaneous production of certain—sometimes more, sometimes less, but in every case of several—musical tones of different intensity and pitch.

Considering the transmitter, we can commence its examination by exciting before the diaphragm not several different tones, but only one, at the same time sustaining an intensity which is very nearly constant. From the measurement of the alternating current generated in the secondary coil we can make our conclusions as to the performance of the transmitter with this particular sound. By the repetition of this test with another sound of different pitch, we may observe the behavior of the transmitter with this other sound. Thus we can by a series of trials with several different sounds examine the action of the transmitter, and determine according to th ebehavior of the transmitter with different sounds a certain law for this action.

The principle is simple and easily understood, but

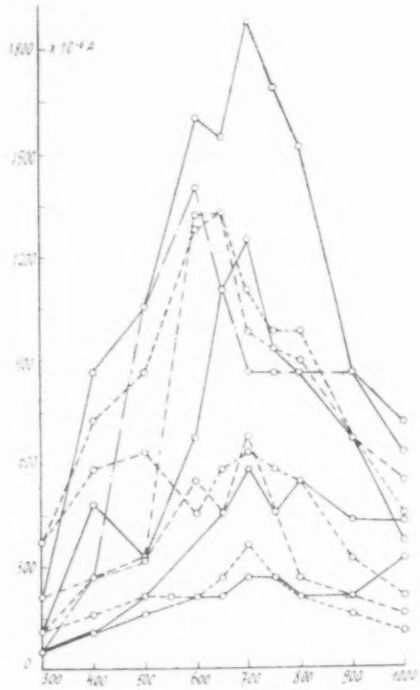


Fig. 1. Relation of Current to Frequency.

the execution is difficult. To begin with, it is nearly impossible to find a source of sound which can be maintained at even intensity; above all, we must be able to vary the pitch of the sound at will. After having made tests for several years I have found that the best source of sound is one designed by Stern. In this apparatus intensity of the sound is very constant. The pitch may be easily varied, and the management of the device is simple.

After finding a suitable source for the currents it

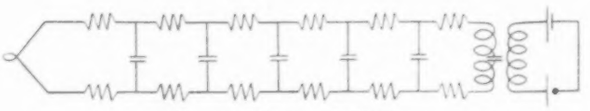


Fig. 2. Diagram of Circuit.

was necessary to provide for the measurement of alternating current. At the time of commencing this work in 1903 the measurement of weak currents was not developed at all. A reflecting electrodynamometer, by the use of which the telephonic currents could be measured, at that time seemed to be very accurate. But the development of the barretter made the work very simple, and now this measurement, can be easily accomplished.

How many researches, without a correct method pursue an entirely false direction is well shown by Campbell's tests. He did not possess any sufficiently sensitive means for measuring the intensity of alternating current; instead, he measured the voltage with the aid of an electrostatic reflecting voltmeter, and hence met with many difficulties. He was forced to use strong continuous current in the transmitter. Campbell himself was not satisfied with his results, for he declared that after the experiments he found it odd that the microphone could be capable of reproducing human speech in its fine shades. Campbell's researches had the cardinal error of taking the voltage measured at the terminals of the induction coils as a measure of the action of sound. It is a well known fact that the current generated in the secondary circuit is not determined by a single quantity. In the case of these measurements the impedance of the circuit was composed of the induction coil and the electrostatic voltmeter. By the insertion of different condensers we can change at pleasure the total impedance of the circuit, and thus the current and the voltage. It may happen that for a certain pitch the circuit becomes resonant, while the same circuit will not oscillate at a less or greater number of periods per second. Thus we have really reproduced not merely the curve of sound, but have included in our measurements values dependent upon characteristics of the circuit. In consequence of this the measurements are entirely misleading, since we have determined the relation between the circuit and the frequency instead of the relation between the number of oscillations of the source of sound and the action of the transmitter.

We may avoid this error by taking for each sound considered only the strongest current which is produced in the circuit. For each particular sound there are put in the circuit as many condensers as is necessary to obtain resonance. In the case of resonance the intensity of the current depends not merely on the in-

*Abstract of paper presented at the International Conference, Paris, September, 1910.

tensity of the source of sound, but also on its uniformity and on the action of the transmitter, and thus the current, found at the time of obtaining the electric resonance, is in effect the factor measuring the action of the transmitter. In this manner I have determined the curves of the transmitters reproduced in Fig. 1. The numbers of oscillations of the sound wave have

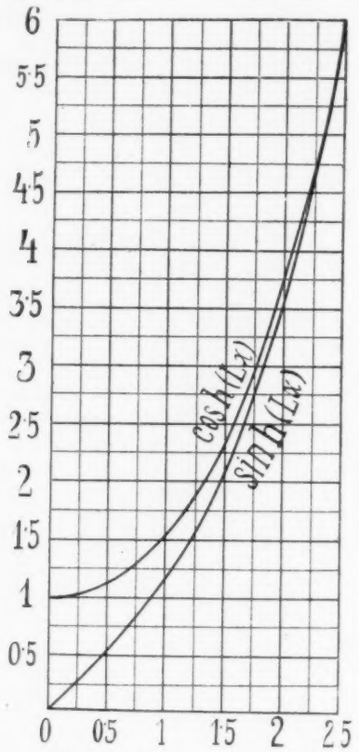


Fig. 3. Values of Hyperbolic Sine and Cosine.

been plotted as abscissas and the ordinates are the values of the intensity of current measured with the barretter in the secondary circui twith electrical resonance, in microamperes. The transmitters are of Hungarian manufacture, and, as may be seen, of different values. An artificial line was also inserted in the circuit as shown in Fig. 2. The characteristics of the artificial line (resistance, self-inductance, capacity) were such that the artificial line corresponded to an effective impedance of nearly 4,700 ohms. To make this better understood, I might observe that the total impedance in a circuit of 700 kilometers (435 miles), consisting of copper wire four millimeters in diameter, mounted on double supports, is 3,330 ohms, and that of 800 kilometers (500 miles) 5,070 ohms.

The differences shown between the transmitters examined has involved me in the most minute search of the cause of the variations. It seems probable that by selection one might succeed in finding those which give a current stronger and more nearly alike, so that transmitters of a superior order might be constructed. In applying the principle of selection to transmitters, I have found that the transmitters of a common battery lend themselves best to development. While the fundamental tones of the transmitters of other systems were lower (about 600), the natural frequency of the common battery is about 800. Considering that the number of oscillations of the ordinary vowel *a* exceeds 900 (its harmonic oscillations are, of course, of higher frequency), it is of prime importance to consider that transmitter the best which, by reason of this high fundamental tone, is capable of giving the higher tones in a manner which more nearly conforms with reality. In consequence of the effect of capacity and conductivity, the higher tones are more damped in their course through the conductor, and hence it is desired that the transmitter should make the higher tones of speech proportionately stronger than the lower tones.

It is found from the pursuit of the present researches that advances are possible by the elevation of the fundamental tone of the transmitter and by the employment of a construction permitting high-voltage batteries, and consequently avoiding heating, even with a very strong current. As for the necessity of the elevation of fundamental tone, I had already discovered that in 1906. It is true that many difficulties were met with in carrying it out. The question has been satisfactorily solved by the engineers, Egner and Holmstrom.* The diaphragm of their transmitter is quite large, and tightly stretched by the tension mechanism, by which the fundamental tone of the diaphragm of the transmitter can be raised. In the use of such a transmitter the highest tones remain, in a long circuit, strong enough to be understood, and one can speak better and at longer distances than with the transmitter previously employed. As the principle of tension as such cannot be patented, the inventors concerned themselves with the theory of the points of

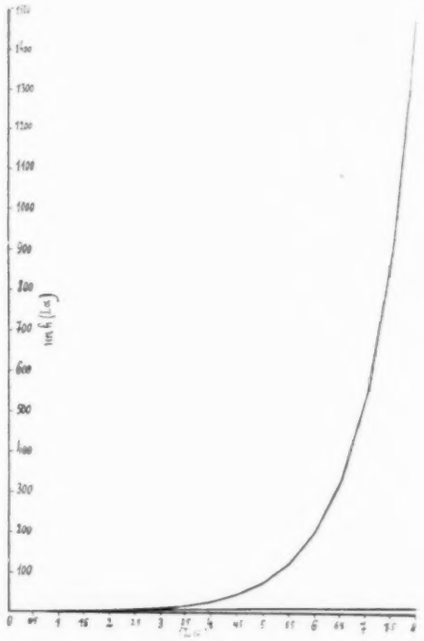


Fig. 4. Rapid Increase in Hyperbolic Sine.

junction with the diaphragm, and have under this title acquired a patent. The inventors claim to operate the transmitter with one ampere, and this heavy current assists in obtaining the excellent results. According to their statement, Egner and Holmstrom have oper-

*"Trials with a Long Distance Microphone," by C. Egner and I. G. Holmstrom, Telephone Engineer, January, 1910.

ated over a distance of 3,189 kilometers (1,982 miles) with a copper wire 4.5 millimeters in diameter.

At present there are employed in the world more than 5,000,000 transmitters, and if the development goes on rapidly this number will reach, in a few years, probably even before the general use of the Egner-Holmstrom transmitter, as high as 10,000,000. It is desirable that the transmitters already existing can be remade in such a manner that they will stand a current of one or more amperes, and they thus may be employed in long-distance telephony. The remodeling has been done in a very simple manner, that is, with the application of cooling, which lends itself well enough to telephony at a distance of 2,500 kilometers (1,553 miles) on a copper wire four millimeters in diameter.

The tests on the subject of a distance limit are not yet terminated, and I have confidence in the possibility of telephoning as far as 3,000 kilometers (1,864 miles), using a four-millimeter copper wire. One might, perhaps, be astonished to find that after having gone

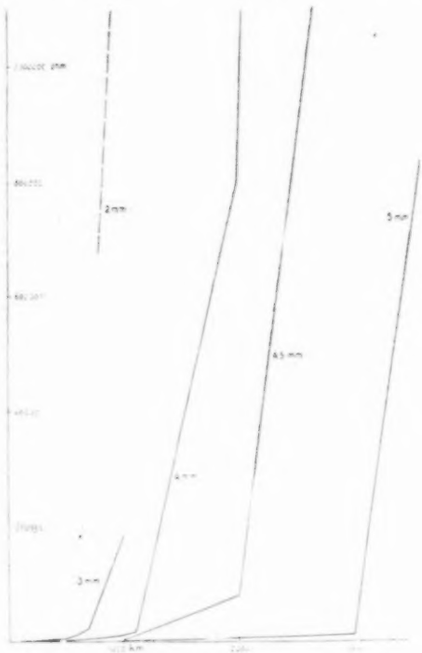


Fig. 5. Total Resistance of Different Circuits.

from 1,000 to 2,500 kilometers, the addition of the 500 kilometers necessary to make the 3,000 would not be done in as easy a manner. It is a human quality that we like to figure such relations as a straight line when very often they are only rectilinear, but logarithmic. Unfortunately, in the practice of long-distance telephony it has been established by Pupin that the product of the length of the circuit and the damping cannot surpass 2.5 to 3. Thus, for example, with damping of a value of 0.003, and the employment of our present transmitters, it might be possible to speak over 1,000 kilometers. At less distances, up to 1,000 kilometers, the product obtained by the length and the damping gives a value which accords very well; at longer distances, the result is decidedly absurd. Better to elucidate this, I will go a little into the theory of long-distance telephony. According to Kennelly the intensity of the current should, with the apparatus now in use, give in the receiver about 1,000 microamperes, in order that speech may be comprehensible. The intensity of the receiving current is given by the equation

$$i = \frac{e}{Z_1} \tag{1}$$

where e is the tension applied at the terminals of the secondary spools; and Z_1 is the equivalent total resistance of the circuit.

$$Z_1 = Z_0 \sinh (L^a) + Z_r \cosh (L^a) \tag{2}$$

where *sinh* and *cosh* signify the hyperbolic sine and the hyperbolic cosine.

$$Z_0 = \sqrt{\frac{r + i\,p\,l}{g + i\,p\,c}} \tag{3}$$

$$a = \sqrt{(r + i\,p\,l)\ (g + i\,p\,c)} \tag{4}$$

where r, l, c, g are the effective resistance per kilometer, the self-induction, the capacity and the leakage conductance; L is the length, p is 2π times the frequency, Z the total resistance of the receiving apparatus.

$$i = \sqrt{-1}$$

$$Z_r = r_r + i\,p\,l_r$$

When the value L^a has passed 2.5, then, as shown in Fig. 3, *sinh* (L^a) and *cosh* (L^a) have nearly equal values; *sinh* 2.5 = 6.05 and *cosh* 2.5 = 6.13; in this case we may write *sinh* instead of *cosh*, which simplifies the expression for Z_1.

$$Z_1 = Z_0 \sinh (L^a) + Z_r \sinh (L^a),$$

or

$$Z_1 = (Z_0 + Z_r) \sinh (L^a) \tag{5}$$

It is seen from formulas (1) and (5) that the incoming current varies with the resistance and consequently with *sinh* (L^a), and only where little values are concerned is it permissible to use, instead of the expression *sinh* (L^a), simply the product, L^a.

In Table I are presented numerical values, which are shown in Fig. 4. With a large value of L^a the

TABLE I.

^aL	*sinh* (^aL)	*cosh* $^aL)$
0.5	0.52100	1.12763
1.0	1.17520	1.54308
1.5	2.12928	2.35241
2.0	3.62686	3.76220
2.5	6.05020	6.13229
3.0	10.0179	10.0677
3.5	**16.5426**	16.5728
4.0	27.2899	27.3082
4.5	45.0030	45.0141
5.0	74.2032	74.2099
5.5	122.3439	122.3480
6.0	201.7132	201.716
6.5	332.5702	332.572
7.0	548.316	548.317
7.5	904.021	904.021
8.0	1490.479	**1490.479**

error may be enormous, thus for L^a=8, *sinh* (L^a)= 1,490, which means that by increasing the resistance we may make an error of about 20,000 per cent. Of course this is inadmissable, but it shows why the procedure should be avoided.

Fig. 5 and Table II show the total resistance of

the circuits constructed of copper wire of different diameters and different lengths. Returning to the case of a four-millimeter copper-wire circuit, we see that up to 1,000 kilometers, in a circuit without terminal apparatus, that is to say, where $Z_1=O$, the resistance to be overcome is 11,768 ohms; we shall have at 2,000 kilometers in the same circumstances to overcome a resistance of 801,390 ohms, and at 2,500 kilometers 6,522,000 ohms. The increase from 1,000 kilometers to 2,000 kilometers does not signify doubling the resistance, but sixty-eight times as much.

To avoid disturbances, the four-millimeter wires of the Hungarian circuit are at a distance of 212 millimeters (8½ inches) from each other, and consequently their self-induction is by comparison with the long

TABLE II.

RESISTANCE OF LINES OF DIFFERENT LENGTHS.

	Diameter of Wire in Millimeters			
$b = 10^{x}$	3.0	4.0	4.5	5.0
r	5.	2.8	2.2	1.7
$10^{3} l$	1.49	1.43	1.38	1.56
$10^{9} c$	11.00	12.00	10.27	10.47
$10^{9} g$	1.	1.	1.	1.
$10^{3} x$	41.58	41.28	40.48	40.53
z° Length in Kilometers	*Value of $Z_0 \sinh (L^a)$ in Ohms*			
	3.0	4.0	4.5	5.0
100	418	318		
200	787	453		
300	1474	568		
400	2972	950		
500	5930	1447		
1000	185720	11768	4009	1024
2000	182160000	801390	81801	
2500		6522800		
3000			1665351	11378
4000			33875725	

foreign circuits proportionately less and their capacity proportionately greater. In calculating the 4.5-millimeter circuit which is in use in our country, on the basis of the foreign arrangement the result for the circuit resistance of the 4,000-kilometer circuit is 33,875,000 ohms. In the telephone experiments at 2,500 kilometers the Budapest cables, with a length of thirty kilometers, have been included; if we compute the resistance of this thirty-kilometer cable and include it in our figures we find that telephony at 2,500 kilometers surpasses the record of the world (4,000 kilometers in a foreign circuit of 4.5 millimeters), and thus the transmitter constructed by the experimental station might be considered as sending over the longest-distance circuit in the world.

As can be seen from the formula (1) the resistance of the receiver is not included in the curves; in the 2,500-kilometer trials the impedance of the receiver employed, Z_1, was about 1,000 ohms, that is to say, $3\times Z_0$, and they have succeeded in overcoming with the aid of the Hungarian transmitter nearly 20,000,000 ohms. In taking a smaller value for the resistance of the receiver or the coil ratio, or a greater value of c, we can hope to conquer yet longer distances, and I have confidence that telephony will be possible at 3,000 kilometers even with a four-millimeter conductor. The distance between Constantinople and London is nearly this, and thus telephony across Europe will not be counted impossible.

Decision on Inductive Interference

In a recent case in which the Lake Shore and Michigan Southern Railroad Company, the Postal Telegraph-Cable Company, and the Western Union Telegraph Company were plaintiffs, and the Chicago, Lake Shore and South Bend Railway Company, defendant, the decision handed down by the Appellate Court of Indiana is of general interest as it upholds the right of the latter to operate a single-phase, high-tension, alternating-current railway notwithstanding it may interfere with the successful working of adjacent telephone and telegraph lines owing to excessive inductive effect.

The suit was originally brought in the Superior Court of La Porte county, Ind., and the railroad and telegraph companies sought to restrain the defendant from operating its single-phase trolley lines owing to interference with their telegraph and signal wires. In the lower court the case was decided in favor of the defendant and was then taken to the appellate court, where the decision of the lower court was sustained. The opinion of the court, as given, is as follows:

In the absence of any charge or showing of negligence, unskilfulness or malice on the part of the defendant, an interurban railroad cannot be enjoined from using in the operation of its cars on the right-of-way belonging to it an electric system known as the single-phase, alternating-current system and the high-tension current of electricity required to operate cars thereby, even though the use thereof may greatly intrfere with the maintenance and use by plaintiff of its electric telegraph lines and signal- necessary in the operation of plaintiff's railroad on its property adjoining the defendant's right-of-way. The use of the single-phase alternating current of electricity to effect a lawful purpose on one's own premises does not constitute a nuisance even though the electricity may escape and interfere with the operation of electrical devi-es on adjoining property. In the absence of negligence any damage caused thereby is *damnum absque injuria*.

In the absence of any physical injury to plaintiff's property or the actual taking of any of it the mere interference by induction with a use which the plaintiff desired to make of such property caused by the use to which defendant devotes its own property in the operation of its cars by electricity does not constitute a wrong which can be enjoined, even though defendant threatens to extend such use to the degree of entirely destroying h value of plaintiff's telegraph lines.

As between the two parties, both using electricity, but for different purposes, under public franchises granted by the legislature, and both conducting business in which the public is concerned, priority of use does not give an exclusive right.

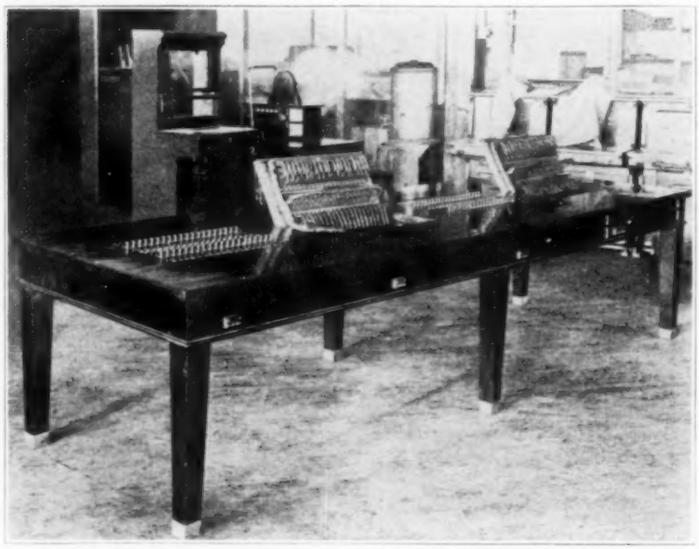
The opinion of the court as manifested in its decision is opposed to the maintenance of a monopoly on the part of the railroad and telegraph companies and would also seem to point out that if induced currents interfere with the successful operation of their systems it will be necessary for them to utilize the various devices and remedies which are provided for overcoming such difficulty. It is possible the case may be taken to the supreme court, but owing to the fact that in Indiana the appellate court is practically a part of the supreme court, it is very rarely indeed that the decision of the lower court is reversed by the higher.

A gentleman in a restaurant had waited patiently for fifteen minutes to get a chance to use the telephone. The gentleman who was using it held the receiver to his ear, but had not spoken at all and finally in desperation the man who was waiting politely said, "Pardon me but may I use the telephone for a moment? I see you have not got your party." "You are mistaken," said the other. "I am talking to my wife."

Getting Business by Telephone

1. Special Service in Retail Stores

THE mail order department has long been an adjunct of large retail stores. It forms a method of selling goods which is convenient both to customer and dealer and has been so largely developed in some houses that the mail order department has assumed a position of great importance, giving employment to numbers of clerks and expert buyers who execute the customers' orders. From the customers' point of view, however, there are drawbacks to the system; first, that it is slow, owing to time wasted in the mails, and second, that it is uncertain and something of a gamble, because the customer has no chance to ask questions, and make certain of what he is buying. He places himself entirely in the storekeeper's hands.



Telephone Order Table at Wanamaker's Store, Philadelphia.

Recently, however, it has become the custom to telephone orders, and this method overcomes to a large extent the above-mentioned difficulties. The telephone order is as quick and handy as one could wish, and allows the customer to get within speaking distance of the store, which is almost as good as being present in person. The retail stores in large cities are courting this kind of patronage, and many advertisements are seen apprising the public of the advantages of telephone order service. Many stores have made known to their patrons that telephone orders will be received and given attention any time of day or night. An order received at midnight will be immediately executed and the goods sent out on the first morning delivery. A few stores have offered special inducements to encourage this kind of patronage, such as paying the telephone charge, local or long distance, within a radius of one hundred miles. One store has installed special equipment to facilitate the service. This is the telephone order table, recently installed in Wanamaker's department store in Philadelphia.

The object of the telephone order table, which is shown in the cut, is to bring the customer into closer relation with the salespeople of the store. By means of it the customer may deal directly with the department where a desired article is kept in stock, and at the same time keep in touch with the mail order department, whose clerks record, and whose expert buyers execute, the order. The customer can communicate directly with the dry goods counter, for instance, and enlist the services of some favorite sales-person whose advice may be relied on in making the purchase. Thus, an element of personalty and directness enters the transaction, not possible under the ordinary mail order system. The fact that the customer is dealing with two clerks also insures greater accuracy and a better understanding.

The telephone order table is operated as an adjunct of the mail order department, and its main function is to serve as a "listening-in" arrangement— a means of allowing the mail order clerk to be present at a conference between the salesperson and the customer. Expediency demands that the mail order department should execute the order instead of the salesperson.

The equipment consists of a mahogany table, 10 feet 6 inches long, by 3 feet 6 inches wide, and 31 inches high, suppplied with four double keyboards, 16 inches by 24 inches, set in the center and flush with the top of the table. A pivot hinge allows each keyboard to swing open, giving access to the keys and other mechanism. Each keyboard is equipped with twenty twin sets of switching keys, line lamps and busy lamps, and each of the twenty trunks is multipled at each position so that any operator may take any call. Eight operators sit before these keyboards and write down the orders.

This table is not in direct connection with the central telephone office, but receives all calls from the Wanamaker branch exchange. The branch operator asks whether the caller desires to give an order, and if such be the case, she connects the caller's line with the telephone order table, where the order is taken up by the first operator who is not busy.

Wanamaker's store is the first to install this service, but no doubt many will soon be following suit. The arrangement is an ideal one for the customer and ought to create a wide popular demand.

An unusual contribution to the campaign for expense and endowment now being conducted by the state executive committee Y. M. C. A. of Ohio was given by Frank A. Davis, general manager of the independent telephone companies of Ohio. Mr. Davis places the unlimited use of the lines of his company at the disposal of the state executive committee for the week which began yesterday.

The Y. M. C. A. at all times has a large bill for long-distance tolls, and with this liberty it is believed several large subscriptions can be secured by personal long-distance solicitation.

Cupid a Good Toll Customer

Is twenty dollars a high price to pay for a few moments' conversation with one's sweetheart?

Lovers everywhere will join the chorus of negation and Angus S. Hibbard, general manager of the Chicago Telephone Company, bears them out. He says: "It is quite a frequent occurrence for Chicago men to pay that for telephone conversations, and many of them are outside the range of sordid business. Even husbands will pay that much to hear the voices of their wives for a few minutes."

Mr. Hibbard's remarks were brought forth by a telegram from Winnipeg, Man., announcing that that municipality was overwhelmed with the immensity of the fact that a "J. H. Grant of Chicago" had paid $20.10 in telephone tolls to ask his sweetheart in Chicago where, how and with whom she had passed the previous evening.

"The telephone is frequently used when there is no material return, as in the present instance," continued Mr. Hibbard. "According to the Winnipeg rate, which is $5 for the first three minutes and $1.65 for each succeeding minute, the young man must have talked to his sweetheart twelve minutes. And I suppose he thought it was worth it.

"I remember hearing of a young man who entered a hotel to talk to his sweetheart. He wanted an answer, too, just like the Winnipeg man. I suppose you'd call it 'stringing him along,' but whether that's the name for it or not, the fact remains that when he finally did get his answer the unfortunate youth had not enough money to pay his wire bill, and the hotel people wanted to have him arrested. And even then, as the case didn't come under my personal supervision, I don't know whether he got the right answer or not."

One of the young women who watch the little sparkles of light in the switchboard at the Palmer House read with contempt the story of the man at Winnipeg.

"Pooh," she said, with a sneering toss of her head, "that's nothing. I can beat that here almost any day. One time I had a man come in and call his sweetheart in New York. It seems from what he said that she was threatening to turn him down, and when he came out of that booth he owed me over $75.

"He talked so long that the supervisor asked me about him and I went to his booth and told him his time was up.

"'I know it, but for heaven's sake let me alone,' he said, and I didn't bother him any more.

"He had called up the girl before, but this was the first time he had been able to get her on the phone in person. Her mother or sister always answered before, and she wouldn't come herself. Yes, he paid the money cheerfully, right on the spot. The girl had promised him to think it over if he would come right to New York, and he was going to take the next train out of town. He looked as though he had been in a Turkish bath fully dressed when he got through."

"Another time, when I was operator at Maywood, a St. Louis man used to call up his girl every night about 11 o'clock or 11:30. She was a singer and she would have to give him a concert over the phone every evening. Her name was Miss Simpson. I don't know if they ever got married, but he never could go home at night without his lullaby over the wire from Maywood. That beats grand opera for price, all right."

"A traveling man was entranced by an actress in New York and would call her up every night," said a switchboard girl in another hotel. "Many times it cost him as much as $28 to talk to her. He was just crazy about that girl. Sometimes he wouldn't be able to get her on the telephone and he would be wild. I don't know what became of the affair. But it isn't anything to have men come in and spend from $10 to $25 on telephone calls to their girls."

A Society of Engineer Draftsmen

First steps have been taken to form a permanent organization to be known as the American Society of Engineering Draftsmen, embracing every branch of the profession, including mechanical, electrical, civil, architectural, marine, sanitary, automobile and aeronautical draftsmen. The formation of this organization, which was conceived by E. Farrington Chandler, a well-known designer and inventor, marks the first efforts to form a national society among draftsmen.

Draftsmen have long felt the need of an organization, both from an engineering and a fraternal standpoint, which would be the means to establish a higher professional standing and place them on a recognized professional plane, in the field of engineering.

The benefits of an organization of this character are well understood and need no elaboration. A decided feature of the society is the opportunity offered juniors, affording means by which they may become familiar with the demands of practice, in the drafting room, while students or employees in other branches of industrial work, as is also an employment bureau co-operating with employers.

The qualifications for membership are such that a standard will be established, as in other branches of engineering, and it is the aim of the society to maintain this standard, and to secure recognition from every concern employing draftsmen.

The officers chosen are E. Farrington Chandler, president; William B. Harsel, vice-president, and Henry L. Sloan, secretary and treasurer, with headquarters at 116 Nassau street, New York.

The Telephone Kills a Graft

The police of New York City expect that an order issued recently by Commissioner Baker, directing the officers in charge of stations to allow persons arrested free telephone calls and the privilege of buying stamped envelopes, will greatly reduce the practice indulged in by officials and hangers-on at station houses of charging exorbitant rates for sending special delivery letters and telephone messages for prisoners.

It was rumored at police headquarters, when the order became known, that once a doorman made about $350 doing errands and telephoning for bail for three hundred prisoners, who were brought in from a gambling house raid.

The new order imposes on the officers in charge of the police stations the duty of telephoning free of charge to three numbers in the city at the request of a prisoner.

What One Woman Thinks

By Sarah Elizabeth Brown

A HAPPY New Year to everybody. I beat you to it, for I have the advantage. A Happy New Year is big in its meaning, but my one sincere wish is that your new year will be crowded with happiness. If double sideboards won't hold it, I'll loan you an extra pair.

My whole tendency is for my home. Women get the credit of being that way, but years of observation has told me that all good men have strong leanings toward home. Most of us enjoy seclusion without knowing it and the home is essentially seclusive. It is human nature to retire from publicity for self-communion. The real enjoyment of friends is in our own homes. There we have privacy—sanctity. It is the retreat where domestic virtue flourishes.

I am rambling along here in this way, for I'm at home—alone. It is all quiet and peaceful—the lull before holidays. I know that this will be held up to the gaze of telephone men in all parts of the world, but why shouldn't it be? They are the wholesale dispensers of a service that adds immensely to the world's enjoyment and their reward can be no greater than a full measure of happiness for themselves. So I say again: "A Happy New Year."

* * *

I am permitting my picture to appear this month because the publisher has been teasing me. I never like to be teased. And then there is the tiniest little excuse, for I've been doing these "Thinks" for a year. It doesn't seem that long, but that's right and I've enjoyed doing it. I hope you telephone men will keep your opinions of me to yourself. Please do me this kindness. You have been fairly good in tolerating me and I have been charitable enough not to judge you by my intimate acquaintance of Obediah. He is only a fair average of a telephone man. He claims no exceptional ability, but he's a splendid provider and he has the satisfaction of presiding at all meetings of his board of directors. Obediah suits me and I guess I suit him. He has always said that I fit into everything about right with the exception of the rumble seat of a run-about and I'll let it go at that.

* * *

Before George W. Perkins and J. Pierpont Morgan had their falling out, Mr. Perkins came close to offering a sensible plan to regulate public utility corporations. He cited the Supreme Court as being the objective goal of all aspiring lawyers. He clothed that august body with all the befitting honors, and with railroads in his mind he wanted a National Board of Control whose members were practical railroad men. For the same reason that distinguished service and ability brings a seat on the supreme court bench to lawyers, the railroad man would aspire to his board of control. I fancy that every industry in this country would eventually have its board of control at Washington if such a scheme should take root. In talking of industries, I would omit the farmer. Some of him would go to congress and worm into the committee of Ways and Means and hold the whole fabric in the palm of his hand.

Speaking of farmers, have you noticed many of them hauling their grain to market? Not in my section of the country! It took some extra cribs to hold the corn and the bins wouldn't begin to hold the wheat and oats, but we kept the stuff on the farm all righty. Run down this increased cost of living thing you city chaps are crying about and you'll find the cause of it out on the farm. A dollar for wheat and we'll give you some. This eighty-cent thing doesn't look good.

* * *

If I keep running in railroad dope you will learn to know what I mean. Railroads are convenient, big institutions that are having their own troubles right now and I like to show, in a feeble way, how they are trying to help themselves. The National Association of State Railway Commissioners held a session at Washington recently, and formulated a plan for getting at railroad valuations. It is good enough to reproduce. The wonder is, why didn't they leave out that word "railroad"—why not "a plan for getting at valuations?" This is the scheme:

1. The actual cost of construction.
2. Cost of reproduction, new.
3. The depreciated value.
4. The amount and market value of stock and bonds issued, with a full financial history.
5. The density of population and traffic.
6. The nature of permanence of population and traffic.
7. Facilities for doing business.
8. Physical characteristics.
9. The amount of earnings and operating expenses.

Now if that scheme wouldn't apply to the telephone business, I'll wager I've burned that last batch of cookies.

* * *

There is one benefit in having a son in Cleveland attending Case College—I get some Cleveland papers. John will be home Christmas and I'll hope to get first-

hand information. Jehosophat Jane, there seems to be enough of second-hand news from Ohio. One would imagine that there were no other telephone centers on earth. They are trying to put over a big one right now and inasmuch as I've had the goosebone pretty well in hand on the "Ohio situation," I'll hazard another guess that this present scheme is only part of the original one. You know they are trying to merge all of the telephone companies in Ohio, both Bell and independent. When one keeps one's eyes on a big project like this it becomes more and more interesting. I am amused at the way the cat gets out of the bag. Remember how Jim Brailey foozled the job at buying—or was it selling—most all of the independent companies in Ohio? How they took him off the job and how he squirmed around afterwards?

Here is another tale which grows out of the deposition of a Bell vice-president. The Bell had been negotiating for all those big independent companies in Ohio and Indiana for a long time and it developed that money would acquire control, but the Bell got chilled Trilbies. It was "leary" of the Sherman law. So it decided to evade the Sherman law by slipping about seven million dollars to R. L. Day & Co. and let Dick Day do it. This went along nicely when the Bell lawyers, with a sense of propriety and niceness, again discovered that the transaction was illegal. That left Day & Company, brokers, with seven million dollars worth of independent securities in their hands to sell. You remember how Mr. Morgan was finally trapped in his automobile and told by his Mr. Davison that here was a "good buy"? Remember how he listened a moment—yawned—and then told his man to go ahead—that he must hurry to lunch? Pretty soft, this swinging seven million dollar deals through the window of a touring car to save the coffee from cooling.

Well, Morgan bought 'em and everything in Ohio and Indiana that the Bell wanted Morgan got. He was going into the business to stay. Now we come to this new $50,000,000 merger of Bell and Independent properties. Let me ponder. I wonder if Mr. Morgan and Mr. Vail ever heard of each other. Wall street says Mr. Vail is Mr. Morgan's representative in telephone matters. Poor old, crooked Wall street! Why, Morgan & Company has sold tons of Mr. Vail's securities—every telephone man knows that and most of their wives know the same thing; don't you, girls? So Mr. Morgan and the Central Union are now trying to coagulate. It will congeal all right! And here is one teeny-weeny prog: It won't be a sub-licensee Bell company at all! It will be something else again—neither Bell nor Independent. Probably independent with a little "i."

But it won't go through in a hurry. There are lots of snags ahead and some legislation. Howsomever, that'll be taken care of to fit the exigencies that must arise.

* * *

Another director of the A. T. & T. Co. has been talking and this is part of what he said:

> Neither the security markets nor the general public have appreciated the remarkable betterment in the financial structure of the Bell system. There are no really weak spots today and it was only three years ago that the Western Electric, now probably financed for an indefinite length of time and without bank debt of any sort, was struggling under a load of $24,000,000 floating debt. Those were hard days. Happily they are now but troubled memories.

I hope you will print this for J. C. Kelsey's sake. I heard him say one time that Western Electric was worth four for one with all the wheels tied and the factory windows broken out. Maybe J. C. was right. I suppose he heard about the minority stockholders sharing that extra two per cent dividend with the majority holders a little while ago. Yes? No? After all, it depends pretty much on what you *pay* for a stock, doesn't it?

* * *

I was sorry to learn that the Keystone Telephone Company, Philadelphia, owing to the failure of Fisk & Robinson, its fiscal agent, stood to lose something more than $150,000. At the time of the failure, these brokers had nearly $200,000 of the Keystone's money and if the concern will pay only ten cents on the dollar the loss will fall heavily on the Keystone Company.

* * *

The Central Union Telephone Company has only recently filed its report for the fiscal year, ending December 31, 1909. This report shows that the funded debt of $6,000,000 remains unchanged, but it also shows a credit to surplus. While small, this is unusual, because heretofore the surplus has always shown a deficit. The gross earnings make a very creditable showing—a gain of more than five per cent over the previous year. This amounts to $239,722. I never get any satisfaction in looking over the financial report of a big company like the Central Union. The figures usually give a very brief record for comparison—seldom exceeding a period of three years. This report, on the basis of three years' comparison, shows that the interest charges have steadily increased. Some time ago I had something to say about the Central Union—what it contemplated doing by splitting itself up into several parts and dividing its indebtedness pro rata. It now develops that the stockholders of the company, at a meeting last March, decided to favor the plan of making three separate corporations. Each of these corporations will share its proportion of the present funding debts.

* * *

There are some startling disclosures regarding the Interstate Telephone & Telegraph Company, now that it is in the hands of a receiver. One of the most important of these is the statement that there are applications for nearly 4,000 telephones. I am beginning to think that old Hank Evans was a little bit careless in exercising some of his functions as president of the corporation. Everything points to mismanagement. Now that this concern is in the hands of interests who want to do something commendable with it, a conservative estimate for twelve months shows its enormous earning power and it is a pity that a receiver ever got hold at all. I will not attempt to enumerate the various liabilities, but it is shown that the gross earnings of the company would not fall far short of $400,000 per annum and that the operating expenses would be slightly more than half that amount. The bond interest and other charges aggregate $135,000 and the total operating expenses are set down at $180,000 per annum. Deducting these amounts from the earning power leaves a surplus of $45,000.

Now, if these new figures are intended to convey the proper meaning I am of the opinion that there should be devised an easy method of ousting incompetence. Shortly after this upheaval it looked like the interest on a certain issue of bonds would have to go by default, but the receivers state that this amount will

be paid out of accounts receivable. It is alleged that very little effort has been made to collect money due the company and that the item of $65,000 will be forthcoming.

The greatest thing that concerns me is a demand for 4,000 telephones unfilled. The very idea!

* * *

By the time they get through suing the poor old Continental Telephone & Telegraph Company there ought to be very little left except its high-sounding name. Continental goes the American just one better by grabbing the whole hemisphere. The newest appeal to the Court of Chancery is George E. House, of Wheeling, who alleges that the Continental is insolvent. His petition sets up that the net liabilities of the company are more than $1,700,000 and that its assets cannot be as much as $625,000. If Mr. House has any ground to prove his claim it ought not to require a magnifying glass to convince the court that the old Continental is broke. As I view the matter from this neck-of-the-woods, the Continental was and is a bad actor. I am still of the opinion that independent telephony has much to do and that these monstrous organizations are a hindrance rather than a help. We are not troubled with dual service in our country and doubtless there are many communities that enjoy very thorough telephone service who have very little need of long distance or big holding companies to take care of their affairs. The Continental crowd have shown the world that they never meant to treat the business seriously—that it was a stock-jobbing and security-grabbing organization and that bad men were at the head of it.

* * *

You may remember my curiosity regarding the ultimate purchaser of the Mississippi Valley Telephone Company. I was curious to know who would get it—whether the Kinloch of St. Louis or the Bell of Iowa. It now turns out that a representative of Webster Brothers, a brokerage firm of Minneapolis, did the bidding and he was the only bidder. The consideration was $175,750, but it is not known whether the Bell system or the Kinloch system is back of the transaction. And that is all the satisfaction I get out of it. What is your opinion, gentlemen?

Western Union Has New Telephone Method]

Joint operation of the telegraph and telephone facilities of the American Telegraph and Telephone Company and the Western Union Telegraph Company, which will be extended into all parts of the United States, has been inaugurated in several states.

The new service not only effects co-operation between the telephone and telegraph, but affords the cross-roads store-keeper and isolated farmer the identical conveniences enjoyed by the resident of the city.

Arkansas has the honor of being the first state in which the innovation is launched, while Missouri and Kansas were next in starting the system. Arrangements are being made to adopt the plan immediately in Ohio, Indiana and Illinois. Plans are completed for initiating the service in Texas, Louisiana, Alabama, Kentucky, Tennessee, Iowa, Minnesota and Nebraska, and as rapidly as the preparations may be determined the policy will extend into all the states and territories.

The opening of twenty-two night and holiday telegraph stations in Missouri, Arkansas and Kansas was necessary to begin the service, and the new and old operators employed by the telegraph and telephone companies were instructed fully in their duties, although they were told to strain the regulations rather than disappoint a patron.

Thousands of towns, even of considerable size, have lacked telegraph facilities at night and on Sundays and holidays; thousands have had no telegraph conveniences at any time, and the resident of rural districts never has been able to transmit or receive telegrams, except at large expense and with difficulty. Country localities really have been inaccessible by telegraph.

By the new system the telegraph reaches into towns, hamlets and out-of-the-way settlements with the assistance of the telephone. Any house or store which has a telephone instrument, though it may be twenty or forty miles from a telegraph station, may receive or issue telegrams.

The Western Union has established in Missouri, Arkansas and Kansas certain zones in which the telephone becomes an ally. Each zone has a center, where a telegraph station is open night and day. Anyone who lives remote from a telegraph station may transmit a telegraph by merely saying to the telephone operator: "Telegram." The telephone operator connects the line with the telegraph station at the zone center, and the message is accepted by the telegraph operator. If a telegram is directed to a person who has a telephone, the message is delivered from the last telegraph station by telephone.

Persons who have no telephones may arrange with the storekeeper, the notary public, or any owner of a telephone for the receipt or transmission of a telegram. The system will be operative day and night, but, in order to provide for the handling of night messages, it was imperative to install new stations, which will be open nights and holidays.

In detail the system works in the following manner: If a citizen of Columbia, Mo., wishes to send a telegram at night, he calls the telephone operator.

The telegraph station at Jefferson City, the center of that zone, responds and takes the message. If a resident of Canton, Mo., wishes to send a telegram, his telephone is connected with the telegraph station at Quincy, Ill., which for the present is the zone center for a few Missouri towns. If someone at Delta, Mo., would send a telegram, his telephone is connected with the telegraph station at Cape Girardeau.

The author or sender of the telegram is the center of the zone. He need only say "Telegram" to the telephone operator, who knows where the central telegraph station for the zone is located. The operators have been instructed not to adhere literally to instructions. Should they not know the zone in which a telephone is located, they are expected to connect the telephone with any nearby central telephone station.

A small charge will be assessed for the telephone service, but it will not exceed 25 cents for any ordinary message. It is possible that the cost of the telephone service in connection with the telegraph will be less in many instances than the telephone rate between the point of origin and the central telegraph station.

Maps of the zones have not been drafted as yet, although the boundaries of the zones in the three states

mentioned have been described, in circular letters, to the telephone and telegraph operators in each zone. Zones are now being outlined for Illinois, Indiana and Ohio. The plan will be extended as rapidly as possible into all states, and soon all parts of the nation, no matter how remote, will be accessible by telegraph with the assistance of the telephone.

Telephone Hearing Before Interstate Commission

With a view to reaching a satisfactory determination of the application of the present interstate commerce act to telegraph and telephone companies, the Interstate Commission gave a hearing December 7, to officials of telegraph and telephone companies, which, by terms of the law, are made common carriers. Some of the questions presented to the conference were:

"What telegraph and telephone companies are subject to the act"?

"May such companies issue franks entitling to free interstate service or may they grant free interstate service"?

"Are telegraph and telephone companies required to file with the commission their tariffs of charges"?

"Does the law forbidding rebates and undue preference apply to telegraph and telephone companies"?

Commissioners Harlan and Lane were absent. Rush Taggart, representing the Western Union Telegraph Company, said that all the lines which he represented came under the provisions of the new law and that there were no secret connections which could escape the provisions of the law.

Speaking of the exchange of courtesies in permitting free business, Mr. Taggart thought that the law defined that the railroads and telegraph companies were separate and free business permitted on one should be of the same type as on the other. In answer to Chairman Knap he said that he did not know whether the railroad and telegraph companies should exchange courtesies or not. Mr. Taggart said that the law does not provide under section 6 that all telegraph companies shall file tariffs of rates, because the section applies to transportation and not transmission. Furthermore he was of the opinion that the law does provide that the telegraph companies shall be punished for discrimination and giving rebates. However, the business is permitted to be classified and rated.

Commissioner Clark suggested that if the telegraph and telephone companies were not forced to file their tariffs they could change the rates on a minute's notice and thus escape the punishment for discrimination, nor could the commission suspend rates as provided by law. Mr. Taggart said that he had not studied this phase of the question.

Hunt Chipley, for the American Telephone & Telegraph Company, said that the law differentiates between transmission and transportation. He held to Mr. Taggart's views to the extent that the law does not require telephone companies to file tariffs. Moreover, he said that it would be a physical impossibility for the company to file a tariff at each station, as every 'phone is a station. He stated that the company had 5,000,000 telephones and about 1,420,000 rates. Mr. Chipley pointed out, however, that local business is entirely intra-state and therefore escapes the law.

N. Koenigsberg, representing the International News Service and the National News Association, said that the law does provide for the filing of tariffs and that these tariffs are now in printed form. He desired further that contract rates made with large users of the telegraph and telephone be placed on file and subjected to the law prohibiting discriminations.

J. D. Cable, representing the Ohio Telephone Association, said that the local lines in his state had a contract by which outside business was taken care of. He believed that the local companies do not come under the provisions of the law.

F. H. Woods, representing the National Independent Association, said that the state connecting lines do come under the law when they do outside business. He said that he wanted all rates filed so that competitive methods could not be used to kill and buy up a small company.

Fire-Killed Pine and Spruce for Poles

A considerable market for the native fire-killed spruce and pine of Colorado may be opened as the result of timber-testing experiments conducted at Boulder by the local branch of the United States Forestry Service. The results indicate that for timber of the same size at the top, lodgepole pine and Engelmann spruce are practically equal in strength to the Western red cedar.

The investigations were made in the timber-testing laboratory of the University of Colorado, on poles nominally seven inches in top diameter and twenty-five feet long. Twenty poles of each species were used, the native timber being donated by the Colorado Telephone Company and the Central Colorado Power Company. The cedar poles were bought by the forestry service in the Denver market. They were cut in Idaho and cost $4 each.

The experiments showed that when the three kinds of poles were of the same diameter at the base, the cedar was considerably stronger, the pine being only 80 per cent and the spruce 64 per cent as resistant and the spruce 79 per cent as strong as the cedar. In elasticity the pine was 98 per cent and the spruce 79 per cent as strong as the cedar.

When poles which had the same top diameter were used, the spruce and pine showed considerably more strength because of the greater degree of tapering which characterizes this kind of timber.

Although the tests showed that cedar is superior to either pine or spruce as a pole or a pole material, the native timber is by no means outclassed and should be found very satisfactory, the forestry officials say.

If the lodgepole pine be treated with a preservative, it will outlast the untreated cedar in actual wear by at least five years. The life of a fire-killed lodgepole pine is twenty-five years. Untreated the pole would last only five years on an average.

Across the English Channel

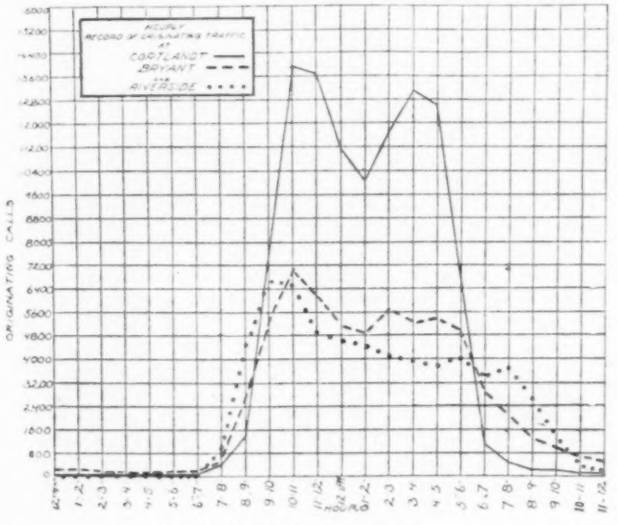
English postal engineers and officials have been conferring with the German authorities with a view to obtaining an improvement of the German land lines, so as to facilitate speech between London and Berlin over the new French cable. The French director of telegraphs states that probably the French government will decide to lay a new cable between Cape Grisnez and Dover, in which case a reduction of the rates may be made.

The Telephone Scrap Book

New York's Telephone Traffic

THE fluctuations in New York City's telephone activity are clearly shown by the lines in the accompanying chart, representing the number of daily calls at three exchanges typical, respectively, of New York's business, pleasure and home life—viz., Cortlandt, Bryant, and Riverside. It is claimed by those in the telephone exchanges that any deviation from this regular daily routine of rise and fall in the number of calls can be invariably traced to its cause.

Cortlandt exchange is the biggest exchange in New York City. When midnight strikes each night,



New York Telephone Traffic Curves.

and a new day begins, the Cortlandt exchange is practically dead. But a change is perceptible at about 6 o'clock. Janitors and other early folk begin to bestir themselves. At once the telephone exchange shows that these people are up and about.

Busier and busier grows the exchange—more and more girls come in, take off their wraps, sit down before the switchboards, and start answering calls.

Then, all of a sudden, the Cortlandt exchange is a Babel. Instead of the dozen listless girls of a few hours before, 170 are at the switchboards, answering calls without one moment's cessation.

Then, as suddenly as Babel burst loose in the exchanges, comes a lull. It is noon. Bosses and employes are out to luncheon. The number of calls which they have to handle drops by the thousand.

Then—from 2 to 4—there is furious buzzing in the exchange again. Wall street is still alive and kicking, and so are the thousands of miscellaneous business offices which swarm in the streets about the famous thoroughfare.

After 4—a slump. Things grow slower and slower in the Cortlandt exchange. Girls by the dozen put on their wraps and hurry homeward. Eight o'clock—9 o'clock—10 o'clock—only now and then a glow, a listless, "Number, please."

But, in the meantime, other exchanges? Bryant and Murray Hill, for instance, have suddenly begun to buzz with extraordinary animation. People are making dinner appointments, and reserving tables at restaurants, and asking her if she won't go to the theater. For telephone excitement of this kind, there are no exchanges like Bryant and Murray Hill. Their hours of real, crowded life are between 5 and 7, and again from, say, 11 to midnight. They are clearing houses for upper Broadway after dark.

Interesting fluctuations of telephone activity are also noticeable in those districts that are, primarily, residential. Riverside is typical of these.

Business there in the early hours of the morning is slack, as it is everywhere else in the city. It wakes up a bit around breakfast time.

Then, later in the morning, the housewife goes out to talk with the cook and decides what is to be ordered by telephone from the butcher, the baker, grocer, and others of that fraternity.

Presto! Lamps glow like fireflies at the Riverside exchange.

Then the lady of the house goes out—shopping, let us say—and there is another lull.

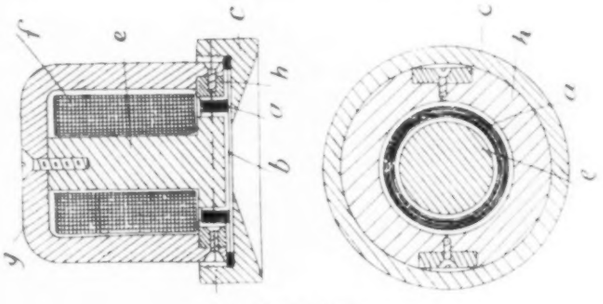
Besides the regular business district, where the hours are roughly from eight to six, there are others which keep telephone operators active at abnormal hours. One of these is the region along West street and contiguous thoroughfares, where wholesale commission merchants and marketmen hold sway. Things spring into life thereabouts at 5 in the morning, and are quite chipper at 6, when not even a janitor is stirring down Wall street way.

Then there are the newspaper offices, where there is plenty of telephone activity between 1 o'clock in the morning and 3, when business and pleasure alike are, as a rule, allowing the operators to lead an easy life.

There is no time when a big city is telephonically asleep.

Dr. Marcer's Telephone

A TELEPHONE receiver whose operation depends on the principle of electromagnetic reaction has been devised by Doctor Pedro Marcer. An electrical conductor carrying a current and located in a magnetic field is affected in a degree corresponding to the rela-



The Marcer Receiver.

tion of its length to the intensity of the current and the magnetic field. In the Marcer telephone an annular coil of wire is mounted on a vibrating diaphragm.

The coil is so located that the vibrations of the diaphragm cause its conductors to cut the lines of force, of a comparatively powerful magnetic field. The coil upon the diaphragm receives the microphonic current and transmits its resultant vibration to the diaphragm. The strength of the magnetic field may, of course, be varied to suit special conditions. In the illustration *A* is the small coil mounted on the diaphragm, *B*. *E* is the coil of the electromagnet, while *G* forms the opposite pole, the annual pole-piece being formed by the iron ring *H*. *F* is the coil which excites the electromagnet. *B* is the cover or ear piece of the receiver. The electromagnet is excited to saturation by local current.

A Porto Rico Telephone Ticket

HERE is a combination ticket or form in use in Porto Rico by the South Porto Rico Telephone Company. Translated into English the form is very well adapted to general use by all small telephone companies where there are not too many sub-departments. This form is used to order a telephone in or order one out, which particular use may be varied to include the whole list; that is, orders for repairs, moving, construction, reconstruction, etc., simply using either of those words to indicate the immediate use and follow the word by the definition of the work it means, such as, for example, "Line 215 and 218 crossed." The form is also used in requisitioning material for substations, for making complaints or reports of various kinds. The ruling, as shown, is particularly well adapted to show costs, and for listing items referred to in any kind of a transaction. Even short official orders, inter-office correspondence, etc., may be conducted with its aid. Our illustration shows the form just half size, and so its dimensions are adapted to standard size envelopes for mailing. The ruling in the lower part of the form is extended over onto the back so that an extra long cost record may be carried forward. The South Porto Rico Telephone Company says that the ticket or form saves considerable printing cost by eliminating other forms, and is extremely useful. The form is in Spanish. We give below the English translation of the headings in their order:

SOUTH PUERTO RICO TELEPHONE CO.

OFICINA ..... P. R.

Fecha ..... 190..

Orden Para: .....

Nombre .....

Localidad .....

Reportado ..... M. Fecha .....

Salida ..... M. " .....

Arreglo ..... M. " .....

Reporte—material, etc. ..... gastos

$

Firma .....

A la vuelta

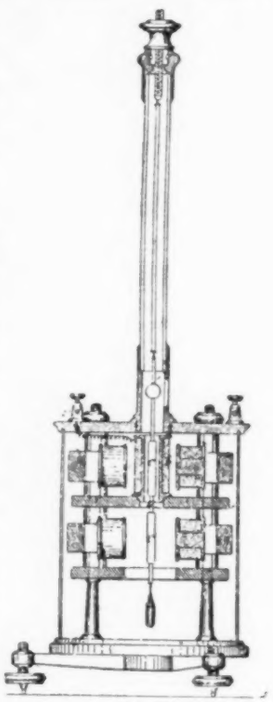
A Porto Rican Form.

"Office."
"Date."
"Order form."
"Name."
"Locality."
"Recorder."
"Time filed."
"Time out."
"Time O. K."
"Report; Material, etc.—expense."
"Signature."
"Forward."

We are indebted to Mr. R. A. Palmer, general manager for the South Porto Rico Telephone Company, for the above information.

The Measurement of Telephone Current

A GALVANOMETER sensitive enough to indicate and even measure telephone currents was devised recently by Ricardo Arno. The instrument is based upon the principle that an iron cylinder in a rotary magnetic field shows considerable variation in hysteresis, under the action of feeble periodic currents. Two hollow steel cylinders are mounted on a single vertical axis. Each is in its own rotating magnetic field, the upper field rotating in a direction opposite that of the lower. When the telephone currents are sent through a coil surrounding one of the steel cylinders a variation is produced in the hysteresis of that cylinder and its equilibrium is affected. The result is a deflection equal to the strength of the telephone current. Arno's latest instrument is adapted to single phase current. Instead of the steel cylinder a wire, tube or magnetic spiral is employed. The resistance of the measuring coil is equal to that of the telephone receiver. The apparatus is sensitive enough to show considerable deflection with an ordinary voice current through a resistance of 100,000 ohms.


The Arno Galvanometer.

A Telephone Whistle Alarm

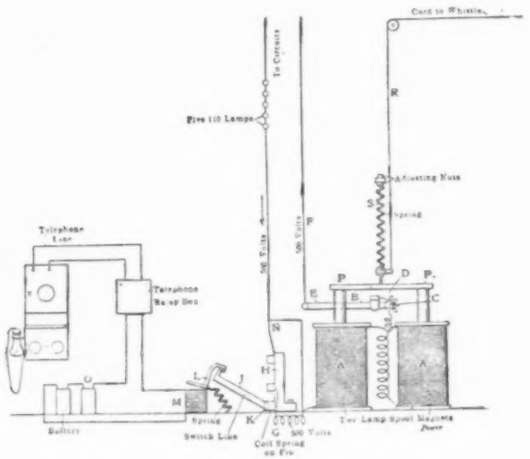
One thing that cannot be heard in the average power plant is the telephone bell and, as a result, engineers have designed various apparatus for signaling their telephone calls, says R. O. Warren in *Power and The Engineer*. The general arrangement is to have a bank of five 110-volt lamps in series, with perhaps a red light to distinguish them from other lamps that might be in the station, but even this is not effective.

In the plant of the Charleston Street Railway and Power Company, Charleston, S. C., the chief engineer has arranged a whistle signal. Placed in a booth is a telephone of ordinary design, a telephone-relay box, a small magnet, which operates a switch automatically, two arc-lamp coils with their accompanying armature and a second switch. The general arrangement is shown in the accompanying illustration.

Above the lamp coils *A A* is a switch *B* which makes

connection with a contact *D*. The blade of the switch has a pin at *C*, and is pivoted at the end *E*. A wire connection carrying 500 volts is attached to *E*. When the switch is in contact, as shown, the current passes out through the wire *F* from the switch *B* and coils *A A*.

Placed at a convenient point is a switch *H*, having two contact pieces, the knife blade *J* being pivoted at *K*, and held in an open position by the small catch arm and spring attached to the armature *L* of the magnet *M*. The lower terminal of the switch *H* is connected to the



Wiring of Whistle Alarm System.

wire *G*, while the upper terminal is connected to wire *N*. The current passing through the coil *M* is obtained from the batteries *O*, the wires from which also pass to the relay box.

The operation is as follows: When a telephone call rings in, current from the batteries passes through the magnet *M*, which draws the armature *L* down and releases the catch from the end of the lever *J*, which is thrown into contact with the switch terminals by a coil spring placed on the pin at *K*. This sends a current of 500 volts through five 110-volt lamps, connected in series, and at the same time allows current to pass around the coils *A A*, which draws the armature of that set of coils down with a sudden movement and in so doing the handle *C* of the switch *B* is brought in contact with the armature *P*, which throws the switch out of contact with *D*. This breaks the circuit through *A A*, although the lamps still continue to burn.

In its downward movement the armature *P* draws down the cord *R*, which is fastened to the lever of a whistle, and blows the whistle twice. This double blow is obtained from the amount of slack in the cord *R*, and the action of the spring *S*, which causes the armature *D* to return to its original position after being drawn downward by the current passing through the coils *A A*. When the call has been answered the switch *J* is thrown out of contact and held open by the arm *L* and the switch *B* is thrown into contact and held in place by the friction of the contact piece.

The effectiveness of this alarm was demonstrated while the engineer and the writer were out at the coal pile discussing the merits of various kinds of coal, the whistle alarm being distinctly heard above the noises of the plant.

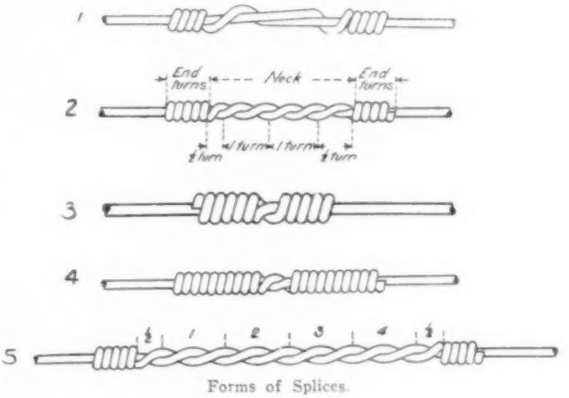
Galvanized Iron Wire Splices

COMMERCIAL galvanized iron wire cut from coils in the stockroom of a telephone company was used in making a series of tests of splices, as related by C. T. Rashman in the *Electrical World*. It was probably of the grade known as "best best" or BB, although it was not possible to ascertain accurately what the grade was. The samples were tested in an Olsen testing machine.

First, a length of No. 12 (B. W. G.) wire was stressed to failure and was found to break at 475 pounds. This value is the average of several. Then splices of the typical forms of Figs. 1, 2 and 4 were made of No. 12 wire, and tested to destruction. None of the three was found to be as strong as the wire of which it was made. Finally, after some trials, splices like that shown in Fig. 5 were formed and it was found that the wire would break before a splice of this type failed.

Splices like Fig. 1 are made by clamping the two wire ends in a pair of connectors and forming the wire into close end-turns around the wire bodies. When such a splice is subjected to tension the end-turns first pull together along the main wires and finally assume the position indicated in Fig. 3. Then, as the stress is continued, the end-turns gradually upwrap and the two spliced wires usually pull entirely apart. In some cases one of the wires will break before the end-turns entirely untwist. The break often occurs at a point where the wire is nicked in making the splice. Increasing the number of end-turns increases the load at which the joint will start to yield, but in no case could a joint having a reasonable number of end-turns of this type be made to develop the full strength of the wire of which it was made without yielding excessively.

In Fig. 4 a splice is shown which is frequently called in books the American Telephone joint. It has a short neck containing one turn and a number of end-



Forms of Splices.

turns varying with the maker of the splice. The idea appears to be prevalent among linemen that the strength of a splice is dependent almost wholly on the number of end-turns it has and that the number of turns in the neck is of little consequence. It was shown by tests that this idea is erroneous. As tension is applied to a joint like that of Fig. 4 it will untwist entirely, or often, partially untwisting one of the wires, will break at a load considerably less than one equivalent to the full strength of the wire.

Several sample splices were made, each having but two end-turns, but the number of turns in the neck was made different in each case. Each of these splices was tested to failure. The results of the test were as follows;

Turns in Neck.	Failure Tension, Pounds.	Cause.
3	230	Splice slipped.
4	230	" "
5	475	Wire broke outside of splice.
6	475	" " " " "

The joints for the above-recorded tests were all made from No. 12 wire having a breaking strength of 475 pounds. The results in the table are averages of several.

Fig. 5 shows a joint having five turns in the neck, that is as strong as the wire of which it is made. When subjected to tension such a joint will at first yield slightly until it is "set," but as the load on it increases there is little yielding and finally one of the wires will break outside of the joint at about its normal breaking point. The length of neck of such a joint is determined by the size of the wire composing it. In each case the neck length should be such that it will just safely contain five turns. If the turns be made too short the wires will be "burned" in twisting the splice and if the turns be made too long their power of resistance will not be a maximum. It was found that proper neck lengths to contain five turns safely for different gauges of wire are about as follows: No. 14 wire, 3½ inches; No. 12 wire, 3¾ inches; No. 10 wire, 4 inches; No. 8 wire, 6 inches; and No. 6 wire, 7 inches. After the tests were completed on splices made from No. 12 wire, more were made on the other sizes given above and it was found that for each size the number of turns in the neck of a safe joint should be five. Although five end-turns are shown in the illustration of the typical safe joint, Fig. 5, the tests indicated that two are ample. A joint having five end-turns has a better appearance than one having two.

A few soldered joints were tested and it was found that, at least for the wire sizes used, almost any joint if soldered would develop a strength greater than that of the wires composing it. Joints of No. 12 and No. 14 wire made with one twist in the neck and one end-turn at each end would, when subjected to tension, remain intact, while for the wire from which the joints were formed would break outside of the joint.

Summarizing, the results of the tests may be stated as follows: (1) End-turns do not have much holding power. (2) Most of the holding power of a joint is due to the turns in the neck. (3) A joint having five properly made turns in its neck will be as strong as the wire from which it is made and will yield but little when stressed.

Measuring Telephonic Self Inductance

TO measure the effective resistance of inductive circuits at telephonic frequencies is difficult in cases where the inductance is large compared with the resistance, as in loading coils for telephone circuits.

In a method described by Charles E. Hay in the London *Electrical Review*, the apparatus is connected up in the form of a Wheatstone bridge, as shown in Fig. 1, a telephone being used in place of a galvanometer.

The resistance (r) must be capable of very fine variations, and also the capacity (k); for the latter, mica and air-condensers are necessary. It is also very important that the insulation of the different apparatus and the wiring should be very high, and, in order that the capacity to earth of the leads to the source of E.M.F. and the generator should not affect the test, it is best to take the current to the bridge from the secondary of a transformer which has its windings highly insulated from each other. Means should also be adopted

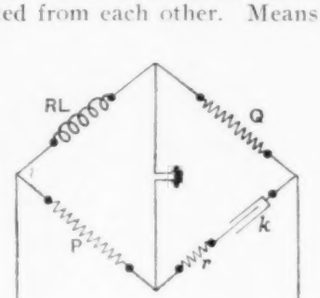


Fig. 1.

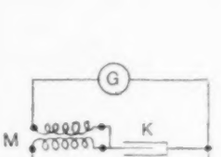


Fig. 2.

Measuring Telephone Inductance.

to avoid capacity between the primary and secondary windings.

Assuming a sinusoidal E.M.F., for balance,

$$[P\,Q - (R + L\,\theta)\,(r + 1/k\,\theta)]\,v \sin wt = 0,$$

where θ is d/dt.

$$\therefore [R + \theta\,(k\,r\,R + L - P\,Q\,k) + \theta^2\,L\,k\,r]\,v \sin wt = 0,$$

$$\therefore [(R - L\,k\,r\,w^2) + (k\,r\,R + L - P\,Q\,k)^2\,w^2]\,v \sin wt = 0.$$

From which

$$R = L\,k\,r\,w^2,$$

$$R/L = k\,r\,w^2 \qquad (1)$$

$$L = P\,Q\,\frac{k}{k^2\,r^2\,w^2 + 1} \qquad (2)$$

$$R = P\,Q\,\frac{k^2\,r\,w^2}{k^2\,r^2\,w^2 + 1} \qquad (3)$$

Since these expressions contain w, the E.M.F. must be sinusoidal, and the frequency accurately known. At the moment of making a test the actual frequency can be determined electrically as follows:

A variable mutual inductance and a highly-insulated condenser of one microfarad are joined up to a sensitive thermo-galvanometer, as in Fig. 2. For the frequencies met with in telephonic work a condenser of one microfarad and a small range of low mutual inductance only are necessary.

For no current through the galvanometer—

$$w^2\,M\,K = 1.$$

The method is particularly valuable for measuring the effective resistance and self-inductance of loading coils used for telephone purposes. Its usefulness is, however, not confined to this, as it appears to have great sensitivity over a very large range.

It will be observed that the ratio R/L, which is required in connection with the loading of telephone cables, is very easily obtained by the method, being simply equal to $k\,r\,w^2$.

In the diagrams, R is the effective resistance to be

measured; L, self-inductance to be measured; P Q, non-inductive anti-capacity resistance (variable); *r*, balancing resistance (variable); *k*, balancing capacity (variable); *w*, *n* times the frequency of alternations.

A Simple Wireless Telephone

The following simple apparatus will enable any one to hear articulate speech 55 feet through any number of walls or other obstructions without any wire connection, while with the same instrument the music of a phonograph may be heard distinctly a distance of 67 feet, says Alan S. Dana in the *Scentific American*.

The transmitting apparatus consists of three parts: Transmitter, sending coil and battery. I use a twenty-five-volt transmitter, which, I find, works better than one made for lower voltage. The sending coil is made by using two pounds of No. 18 copper wire formed into a circle four feet in diameter, the wire being held in shape by winding it with rubber tape, thus making a neat finish. By using the same length of No. 16 or No. 14 wire the sending distance can be increased. In order to get the circular form I drove nails into the floor in a circle, carrying the wire around them until the requisite length of wire was used. Wooden dowels were used to keep the circle formed by the wire in a stir and portable form.

A six-volt storage battery is used, supplying about one ampere, but naturally a battery of greater voltage will increase the sending distance. A press-button switch to connect the battery when one is speaking completes the sending end.

A similar coil and a receiver are needed for the receiving end. The coil is formed in the same manner as the first mentioned one, only that two pounds

Fig. 1.—Method of Transmitting Music.

of No. 24 copper wire are used, but a greater length of wire would increase the range of the set.

The receiver used is a 1,500-ohm wireless telegraph, but I find one of a 1,000 ohms is practically as good. Either of these is much better than the usual 75-ohm receiver. Of course the principle involved is that of induction, and obviously it is necessary to have two sets of the apparatus. The alternating current in one coil inductively sets up a current of like nature in the other coil which operates the receiver.

One of the accompanying photographs shows the transmitter connected to a talking machine by use of

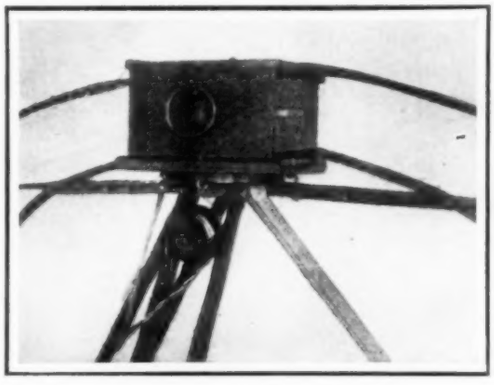


Fig. 2.—Transmitter and Receiver, with Parts of Coils.

a galvanized iron horn, the larger end of which takes the place of the horn of the machine, while the smaller end enters a block of wood. Another hole is made in the wooden block at right angles to the first hole and at the end of this the transmitter is placed.

Another photograph shows one complete set of sending coil, battery, transmitter switch, receiving coil and receiver. The box on the tripod contains the six-volt storage battery. Altogether it makes a light, portable apparatus. As I have two sets, they are sometimes combined in order to get greater distance of transmitting, as shown in Fig. 2.

By the following table one will note that music may be heard a greater distance than speech. One set sends speech 31 feet with 6 volts, sends speech 38 feet with 12 volts, sends music 46 feet with 6 volts, sends music 51 feet with 12 volts. Two sets combined send speech 50 feet with 6 volts, sends speech 55 feet with 12 volts, send music 58 feet with 6 volts, send music 67 feet with 12 volts.

Should the reader give as much enjoyment to his friends as I have he will be well repaid in making the sets.

Englishmen Studying Telephones

John Lee, J. Stewart Jones, A. W. Martin and T. F. Purvis of London, England, representing the Post-office Department of the British Government, are on a tour of inspection of the telephone systems of the United States.

They were in St. Louis several days investigating the local systems, with the view of applying American principles to the telephone system of England, which that government will take over on January 1, 1912.

Mr. Lee, spokesman of the party, declined to talk of his mission or of his official capacity with the British government.

He said he couldn't talk as an English representative. He, however, praised the telephone and telegraph systems of the United States and asked if Americans were pleased at being studied by foreigners.

Finding in Chicago Investigation

The experts under W. J. Hagenah who since last July have been investigating the affairs of the Chicago Telephone Company have concluded their work and have found no facts to warrant an increase in rates at present.

The city council committee on gas, oil and electric light, at whose instance Mr. Hagenah made the investigation, will, unless there is an unexpected change of sentiment, adopt all of the salient facts of the experts' report as the basis for the framing of a rate ordinance.

The Hagenah report shows that while there are some kinds of service that pay the company less than they cost, their very cheapness, in increasing the number of subscribers, increases not only efficiency but the profitableness of other departments of the telephone business.

The necessity for a readjustment of rates along scientific lines is indicated in the report, but this readjustment will affect only such classes of telephone service, reducing some rates and increasing others, as are not employed generally by the great mass of the public.

One of the significant things in the report is the finding that the value of the present telephone plant is between $20,000,000 and $21,000,000. The present capitalization of the company is about $23,460,000, and the stock has been bought on the understanding that the company is to be allowed concessions in the way of rates that would permit it to pay eight per cent.

The matter of valuation of plant comes up again in that portion of the ordinance which authorizes the taking over of the plant by the city January 1, 1919. Under that section it is provided that as a consideration the city shall pay "in cash the then cost of duplication, taking into consideration the then condition of the property less depreciation, with five per cent thereon."

The report shows the enormous development of the telephone business in Chicago in the last few years. The number of subscribers has greatly increased under the present ordinance, and twenty-six distinct branches of service have developed.

The following table indicates the growth in number of subscribers up to the first of this year:

	Phones.
1878	400
1884	3,612
1886	5,612
1894	10,700
1904	86,744
1908	181,533
1909	201,940
1910	223,000

The methods adopted by the committee which has the telephone ordinance in charge marks a new departure in the handling of rate ordinances in that they are scientific. A preliminary survey of the field was made from an analysis of the company's income accounts and balance sheets for each year of operation. These showed the operating expenses in detail.

The income accounts were carried out so as to show the deductions from net earnings for interest on funded indebtedness, on floating indebtedness, appropriations to reserves and for construction, dividends and the like.

The balance sheets were analyzed to show in detail the company's assets and liabilities. The cost of the plant was learned from a review of vouchers from the beginning of the company. The cost of furnishing service was obtained from an analysis of the operating expenses for about two years.

The report contains no specific recommendations as to rates. The basic facts are set forth and if, after the telephone company has been heard, these facts are accepted by the committee rates will be determined from them. The committee members say that the city thus will be able to enact an ordinance that will do exact justice both to the municipality and to the corporation.

New York-Chicago Underground Wires

George W. Jackson, Chicago's champion tunnel builder, is quoted as saying that a tunnel from Chicago to New York, capable of carrying telephone and telegraph wires and pneumatic tube for freight, is feasible from an engineering standpoint, will have the backing of the United States Government, and will be built in the near future.

Mr. Jackson declared financial arrangements had been made and engineering plans drawn up for the bore. Eventually, it is hinted, the tunnel will be extended to the Pacific Coast.

Mr. Jackson refused to give out the names of his financial backers, but it is said the American Telephone & Telegraph Company is behind the plan. Though the initial expense would be large it is believed the profits eventually would be enormous and that much of the business of the railroads in transporting freight between this city and New York would be diverted to the tube.

It would take about eighteen months to construct the bore, and, as little work can be done till next spring, the tunnel will be completed about two years from now. The tube will be large enough to carry packages fourteen inches in diameter, and telephone and telegraph wires.

The Telephone Company denies any interest in the project.

More Pay for Operators

Notices were posted in several telephone exchanges by the New York Telephone Company recently announcing that there will be a general decrease in working hours and an increase in pay to all telephone operators as soon as the Company can get 800 more operators to increase the present force. This, it is believed, will be on January 1.

Day operators, who now work nine hours daily at from $4 to $9 per week, will have to work only eight hours under the new arrangement, with no increase in pay. Evening operators, who now work eight hours, at $8 per week, will have to work only seven hours, and will get $9. Night operators will have their work hours cut down from ten to eight, and will get $11 instead of $9 as at present.

In addition to these advantages, it was announced, the present policy of requiring the telephone girls to take turns at working on Sundays and legal holidays will be less disagreeable by giving an extra half-holiday each week to those who work on Sunday or holidays in addition to their regular pay therefor.

Who's Who in the Telephone Game

Facts and Fancies About a Man You Know or Ought to Know

RUH-RUH-RUH—hail the day—here is Eric's son, hoo-ray! For two whole years you have been observing a new face in this frame of cold type—always a face of a telephone man and nearly always a telephone engineer. These men are alike only in that they are telephone men. There isn't any rule to govern. Here we have Frederick R. Parker. He was called Freddie till 1900. Then, like a pollywog, he shook off the end of it and you know the rest. Fred Parker is a Hoosier—a Purdue University grad. Like nearly all telephone engineers, he has tried more or less everything.

Fred Parker was born at La Fayette, Indiana, October 23, 1876. His parents wanted to have something to commemorate the Centennial! The citizens built a Centennial school house in La Fayette that year and Freddie started to go to that same school six years later. Two years afterward, his parents deserted the banks of the Wabash; packed their goods and Freddie and moved to Kansas. They settled on 400 acres of prairie and put in the next ten years, with Fred's help, making a farm. There was no school house on the farm, but Fred found one and hiked to it and from it as a mild form of exercise after chores in the morning and before chores in the evening. Oh! you old Kansas farm, with your beckoning areas, your hot winds and wintry blizzards—the roar of Niagara is better. But Kansas pioneering made fighting men of her boys and Parker is happy in the reveries of good old days.

He Was Called Freddie Till 1900.

So he had ten years of Kansas. Then he moved back to the Wabash—God's country! He was eighteen when he entered Purdue and graduated June 8, 1898, with the E. E. degree. In his final tests he stood 55A's and 5B's with nothing lower. And from a private in the rear rank he rose to lieutenant—reward a-plenty.

In nearly all of these type frames of world-famed telephone celebrities, you may have observed a marked tendency of college graduates to rush into the office of the Bell Telephone Company for a job. Fred Parker did the same. The ink was hardly dry on his sheepskin before he came to Chicago and was connected up with the Chicago Telephone. He was assigned drafting, then cable testing, then designing. He had charge of the annual cable test for Chicago's big system and just before cutting loose he designed the big power and lighting switchboard now doing service at Main exchange. If you want to see a good job, go in and look it over.

But now we have a brand new wrinkle—a positive diversion from the ordinary, for Frederick R. Parker threw up his telephone job and joined Hall Caine's "The Christian"—peerless, onliest and original show then playing New York. Fred took the job as assistant stage manager, assistant electrician, assistant actor—that really ought to stand for a moment, even though it isn't right—and assistant tenor—if that be possible. But it all worked out nicely for it wasn't long till he was doing tenor in light opera unassisted and in two nine-month seasons he did 60,000 miles, which is near record for tenors! For Fred can sing some, which may account for his living in Buffalo! Jokes aside—if you have observed a joke anywhere within forty miles of here—The Christian made good and as usual the little blonde tenor was right up in the front row with the spot light penetrating his long silken locks. So when you hear Fred Parker humming "The Mikado" or "Erminie," excuse him for he may want to spring his whole show on you. And they do say he can trum a banjo to beat the band. He got the idea as a cable tester.

Three years in the "show business," doing the circuits, was a post-graduate course quite extraordinary for a telephone man, but it was enough and Parker quit. He went right back into the circuits of the Stromberg-Carlson Telephone Manufacturing Company's switch boards and retired a year later to do some development study on his own inventions.

In 1903, Parker associated himself with Frank B. Cook and for five years he was confined to further development of Cook's apparatus, acting also as a patent attorney. Leaving Cook, Parker went back to Purdue for some more post-graduate work and then embarked for himself as a patent attorney. For a year he maintained his own offices in Chicago.

Right now Mr. Parker is chief engineer for the Ericsson Manufacturing Company at Buffalo. He is wholly surrounded by fresh air and lots of things to do. The factory, out on the Military Road, is equipped to

do those things that Parker has in mind and his tendency to develop will have no limitations.

His "going it alone" was interrupted in 1907, when a life partner took him in. Parker is short in stature, but long in his capacity to eat. The Ericsson Company has a restaurant on the premises—a feature found to be excellent and expedient after the advent of their present chief engineer. The "gang" gather around the festive board and help themselves first. All that is left goes to Parker and to beat the game there is a tentative understanding with the cook that there is to be more in the kitchen. When you are in Buffalo, remember that you haven't done the town till you see Parker eat!

North Dakota Statistics

Interesting figures indicating the telephonic growth of North Dakota are contained in a statement prepared by State Auditor D. K. Brightbill and his deputy, C. Jorgenson, which has just been made public. It shows that there are a total of 226 exchanges operating in the state, being located in buildings used exclusively for exchange purposes, while there are 202 companies organized, all of which made reports.

There are in North Dakota 26,229 telephone subscribers. The pole mileage of the state of all companies operating as rural or long distance lines is 15,373. There are 24,450 miles of wire and 10,557 miles of copper wire on the poles in question, making a total of 35,007, or more than enough to girdle the entire globe.

The assessment on the exchanges in the state is fixed at $443,502, while the assessments on the long distance and rural lines is fixed at $630,531, making a total assessed valuation of more than a million dollars.

One of the very notable features of the telephone statistics in North Dakota is the fact that a majority of the companies operating systems are owned and controlled by the farmers themselves. The lines radiate from all the larger centers in the different communities, farm or rural lines having been constructed with amazing rapidity during the past few years.

In the western part of the state this condition is particularly evident. There a great many of the farm companies have been organized in the newly settled districts, and the result has been to give those pioneers advantages and conveniences not enjoyed by the early settlers of any other section of the northwest. In McKenzie county, which is without railroad facilities of any kind, the telephone has made rapid progress and there are several companies operating over a large section of the county and which serve to bring the settlers into closer touch with each other than is otherwise possible.

Pennsylvania Hotel Pay Stations

The Pennsylvania State Railroad Commission has announced that it has no power to put a stop to the practice of certain Philadelphia hotels in charging ten cents for outgoing telephone calls while the advertised rate of the telephone company is but five cents. The decision was rendered on the complaint filed by R. R. Boggs, of the Travelers' Protective Association of America.

The commission holds, however, that the signs on hotel telephone booths be so changed as to indicate that they are not ordinary pay stations. In its opinion the commission says:

> Inasmuch as the facts developed at the hearing in this case show that the rate complained of is the charge established by the hotels, which maintain the service at their own expense, and not by the respondent, which only makes the connections and furnishes the equipment at a uniform price or rate to all under like circumstances, it is evident that this commission is without jurisdiction. Since hotels are not subject to our supervision we cannot prescribe the terms upon which they shall maintain such service, which is undoubtedly a great convenience to their guests and is intended solely for their accommodation, and the respondent furnishes like facilities to all hotels upon equal terms, there is no discrimination practiced by it in this respect.
>
> There is, however, one feature about the conduct of these hotel exchanges which is open to criticism, and that is the fact that the display signs at or near the telephone booths or desks, which are furnished by the respondent, are similar to those used at its public pay stations, and therefore are calculated to mislead the patron and give him the impression that the charge for the service is the same as that advertised and made at such public pay stations. This should be remedied by changing these signs so that they will not indicate that these exchanges are conducted by the respondent and operated at its public pay station rates. Such change in these signs is, therefore, hereby recommended.

The commission was asked to make an inquiry, and if proper, a recommendation against offers of free service of telephones as an inducement to new subscribers. The Johnstown Telephone Company, of Johnstown, and the Petroleum Telephone Company, of Oil City, brought the matter to the attention of the commission.

The Canadian Independent Convention

The Canadian Independent Telephone Association held its fifth annual convention in Toronto November 17. The most important matter under discussion was probably that asking the government to compel the Bell Company to provide connection with other local companies. This matter was covered in one of the following resolutions which were adopted:

> That the following shall be eligible for membership of the association: All proprietors, stockholders and officers of telegraph systems in the dominion other than those owned by the Bell Telephone Company of Canada, or in which that company has a controlling stock interest.
>
> That representations be made to the Ontario government to repeal the present law giving municipalities the power to grant exclusive telephone franchises.
>
> That it is desirable to amend the local municipal telephone act by making provision for the appointment of a board of commissioners by the ratepayers who pay the cost of construction, in each case, to undertake the management of any system constructed under this act.
>
> That representations be made to the dominion government as to the desirability of amending the Railway act, empowering the board of railway commissioners for Canada to order connection between rural telephone systems and the local systems of all companies within the jurisdiction of the parliament of Canada.

The officers elected for the ensuing year are: President, W. Doan, M. D., Harrietsville (reelected); vice-president, C. Skinner, Sherbrooke; secretary-treasurer, Francis Dagger, Toronto (re-elected); executive committee, P. R. Craven, New Liskeard; T. R. Mayberry, M. P. P., Ingersoll; A. Hoover, Green River; Levi Moyer, Beamsville; M. House, Bridgeburg; T. R. Ralph, North Augusta; G. W. Jones, Clarke, Ont.; T. G. Ramshaw, Lowville; George Taylor, Blenheim; auditors, C. B. Adams, Harrietsville, and A. Denholm, Blenheim.

The World's Progress in a Year

By W. H. Gunston*

IF any apology were needed for returning to this subject it is to be found in the fact that the statistics of telephone development in the world are far from being of merely academic interest; and the enormous expansion of the telephone system in some countries, together with its causes, and the failure to make progress commensurate with the importance of the country in others, are full of significance and instructive lessons. Recent statistics of telephone development are notoriously difficult to obtain. In countries where telephone companies are numbered by the thousand or hundred, as in the case of the United States and Brazil respectively, the task is impossible. A recent government census in the one case, and some inquiry as to the larger systems in the other, enables us to get sufficiently approximate figures. The articles published in the *Journal* last year gave the most complete statistics of the kind that had hitherto been published, and that considerable interest is being displayed in such figures is evidenced by the fact that since their publication Herr von Hellrigl has published a similar statistical article in *Electrotechnik and Maschinenbau;* and, from a source which I have not been able to trace, paragraphs on the same subject appeared in the general press last spring. Lastly, the American *Electrical Review* of June 25 last published a comprehensive article on "The Telephone Industry of the World."

There will be nothing unexpected by our readers in the demonstration that Great Britain is not keeping pace in rate of development with some of its rivals. So important a part is the telephone playing, and so increasingly vital a part is it destined to play in commercial progress that the proper development or otherwise of the industry must infallibly leave its mark in each country (in the shape of increased vigor or decline) on that progress in so far as it relies upon this most efficient and rapid of all means of communication.

Unless otherwise denoted the following figures refer to January 1 in each year. Much later figures could of course be given for Great Britain, but for purposes of comparison the development up to January 1 last has been taken all round.

EUROPE.

Great Britain and Ireland had 601,269 telephones in 1910 as against 565,854 last year, the number of inhabitants per telephone being 68. Of these 503,643 were on the National system, 92,626 on the Post Office and about 5,000 in the two extant municipal systems.

The following are the principal urban systems:

	1910.	1911.	Population per Telephone.
London	104,208	181,011	36
Glasgow	43,928	42,855	24
Liverpool-Birkenhead	26,849	27,783	37
Manchester-Salford	21,209	23,462	47
Birmingham	13,479	14,336	64
Edinburgh-Leith	10,889	11,791	44
Hull	10,800	11,060	24
Leeds	9,072	9,365	55

Germany, with 940,966 telephones as against 851,319 last year, is fractionally better than Great Britain in its proportion of population to telephones, which is 65. The development of the principal towns shows Berlin 111,751, Hamburg 53,580, Munich 24,972, Frankfurt-on-Main 80,932, Leipzig 20,682, Dresden 18,104, Cologne 17,471, and there are six others with over 10,000 stations.

France has 211,728 stations as against 194,159 in January, 1909, and the number of souls per telephone is 186. The largest systems are Paris 69,205 telephones, Marseilles 5,975, Lyons 5,283 and Bordeaux 4,137.

Sweden has 179,174 stations (114,734 state, 54,440 company) as against 158,503 last year. The average number of inhabitants per telephone is about 30. Stockholm has 66,669 stations, Gothenburg 11,241, and Malmo 6,018.

Austria-Hungary.—The total number of telephones in the Austro-Hungarian empire last January was 144,684 (over 250 inhabitants to every station) as against 124,825 last year. The administrations in the two component countries are, however, distinct. Austria numbers 94,978 telephones (of which in Vienna there are 41,070, in Prague 6,314, and in Triest 3,379) and Hungary 49,706 (of which 12,377 are in Buda-Pesth).

Russia.—The latest official figures received are for January, 1909, when there were 112,885 stations in existence. They may now be put at about 127,000, or one for every 1,022 of population. The number of stations in St. Petersburg is 27,619, in Moscow 26,140, and in Warsaw 18,979.

Denmark.—The figures in the official annual are given in subscribers' lines. The Copenhagen Telephone Company gives the total number of stations in Denmark at the beginning of 1909 as 78,233 and at 1910 as about 86,000, or one for every 30 inhabitants. Denmark thus fairly shares with Sweden the first place in Europe for proportionate development of telephones. Copenhagen and suburbs have 40,474 stations.

Switzerland has 73,758 stations, as against 69,122 last year—*i. e.*, one for every 47 inhabitants. Zurich has 10,250 telephones, Geneva 6,750, Basle 6,015 and Berne 4,005.

Italy has 62,266 telephones, as against 53,721 last year. Milan has 9,886 stations, Rome 9,014, Genoa 4,907 and Turin 4,063. Population per telephone, 552.

Norway had 58,026 telephones in 1910 and 53,726 in 1909. The present development is therefore one telephone to every 39 inhabitants. The latest figure for Christiania (the largest town) is 15,535 at the end of June, 1909.

Netherlands.—There are 52,635 stations in Holland (of which 30,904 are municipal, 16,185 private companies and the rest state), as against 47,421 last year. Amsterdam has 11,764, Rotterdam 6,669 and the Hague 7,015 stations. The number of inhabitants per telephone is 113.

Belgium has 42,540 telephones, as against 38,503 last year, a proportion of 167 inhabitants to every telephone. Brussels has 15,042 telephones, Antwerp 5,850 and Liege 4,001.

Spain has 20,855 telephones, or over 900 people per telephone. Last year there were 18,462 stations

National Telephone Journal.

working. Madrid has 3,131 telephones and Bercelona 4,210.

SUMMARY OF EUROPE.

	January, 1909.	January, 1910.	Percentage of increase
Germany	857,319	940,966	10.5
Great Britain	564,400	601,269	6.5
France	194,159	211,728	8.3
Sweden	158,503	179,174	13.3
Austria-Hungary	124,825	144,684	16.1
Russia	112,825	127,000	13.
Denmark	78,233	86,000	10.2
Switzerland	69,122	73,758	6.7
Italy	53,721	62,266	16.
Norway	53,726	58,026	8.
Netherlands	47,421	52,635	10.7
Belgium	38,503	42,540	10.5
Spain	18,462	20,855	13.
Roumania	10,520	12,000*	—
Portugal	4,975	5,468	12.2
Luxemburg	2,902	3,100*	—
Bulgaria	1,930	2,500*	—
Servia	1,550	1,750*	—
Greece	1,300	1,400*	—
Iceland	672	900*	—

There were thus upwards of 2,628,000 telephones working in Europe at the commencement of the year.

ASIA.

The total estimated in the *Journal* last year, viz., 100,400, has proved to be substantially correct in the light of later official returns. The only Asiatic state where rapid development has been made is in *Japan*. There were 71,430 stations in this empire at the beginning of 1909 and 81,447 in July. The total for January, 1910, is therefore about 91,000. There are about 24,000 telephones in Tokio and 10,000 in Osaka.

Making due allowance for the increase in the British and Dutch Indies, the number of telephones in Asia as at January 1 last may be put at 123,000.

AFRICA.

There is little change in the position in Africa. Egypt, Algeria, Transvaal and Cape Colony have the four largest systems. Probably not more than 2,000 stations have been added during 1909, making a total existing at January 1, 1909, of about 27,000.

NORTH AMERICA.

Canada.—Here we have an example of one large company (the Bell) operating 117,539 stations (as against 105,770 last year), and several government systems and independent companies operating the remaining 60,000 odd stations. There were 25,300 subscribers in Manitoba in the beginning of the year and the total for Canada may be computed at about 180,000 stations. As regards the large cities, there were 27,037 telephones in Montreal, 28,154 in Toronto and 12,717 in Winnipeg.

United States.—The American Telephone and Telegraph Company and the systems in connection therewith increased from 4,634,629 to 5,142,692 during 1909, a percentage of increase of 10.9. The stations of the innumerable companies of the Independents are difficult to estimate, but the figure in the *Electrical Review* of Chicago last July, viz., 7,083,900 stations for the whole of the United States (Bell and independent companies) is, no doubt, as accurate as it is possible to obtain. This means that there are between ten and eleven inhabitants in the states to each telephone. The Bell company's development in the large cities is New York, 361,302; Chicago, 207,719; Philadelphia, 105,425, and Boston, 120,769.

Mexico.—The official figure of the total subscribers in Mexico at August 31, 1909, was 16,790. The number of subscribers in the two systems in Mexico City in July this year was about 11,000.

West Indies.—The *Electrical Review* gives 12,600 as the number of stations in these islands.

Total for North America 7,293,300.

*Estimated.

SOUTH AMERICA.

The largest systems are those of the United River Plate Company (in the Argentine), the Chili Telephone Company, and the Monte Video Telephone Company. The telephone in Brazil is operated by numerous companies situated in the various towns. The position has not greatly changed since 1909, except for a steady increase in the more progressive states, and the total number of stations on this continent should be about 65,000.

AUSTRALASIA.

No later information has been obtainable with regard to Australia than the figures as at the beginning of 1907 which were used as a basis for the estimate in my article of last year. As regards *New Zealand*, the number of connections has increased from 26,833 in 1909 to 29,681 in 1910, an increase at the rate of 10.61 per cent.

There are altogether upwards of 80,000 telephones in Australasia.

SUMMARY.

Europe	2,628,000
Asia	123,000
Africa	27,000
North America	7,293,000
South America	65,000
Australasia	80,000
	10,216,000

To the list of cities possessing over 10,000 telephones which was given in the *Journal* of November last, may be added Hanover (Germany), Zurich (Switzerland), Osaka (Japan), and Mexico City (Mexico).

It will be seen from the foregoing that the percentage of increase during the year in the larger states is as follows:

Japan (Government)	29.0
Austria (Government)	18.4
Sweden (Government and Company)	13.3
Russia (Municipal, Government and Companies)	13.0
U. S. A. (Bell Company and connections)	10.9
Germany (Government)	10.5
Canada (Bell Company only)	10.4
Denmark (Government and Company)	10.2
France (Government)	8.3
Great Britain (Government and Company)	6.5

The high percentage of Japan is no doubt due to that country's having a great deal of leeway to make up, telephonically speaking. In Austria the measured rates must be accountable for the spread of the telephone. In Russia the energetic companies in Moscow and Warsaw have made rapid progress. But in each of the foregoing states it must be remembered that the telephone development has been so low in the past that any noticeable progress sends up the average in a way that would be impossible in a well-telephoned country.

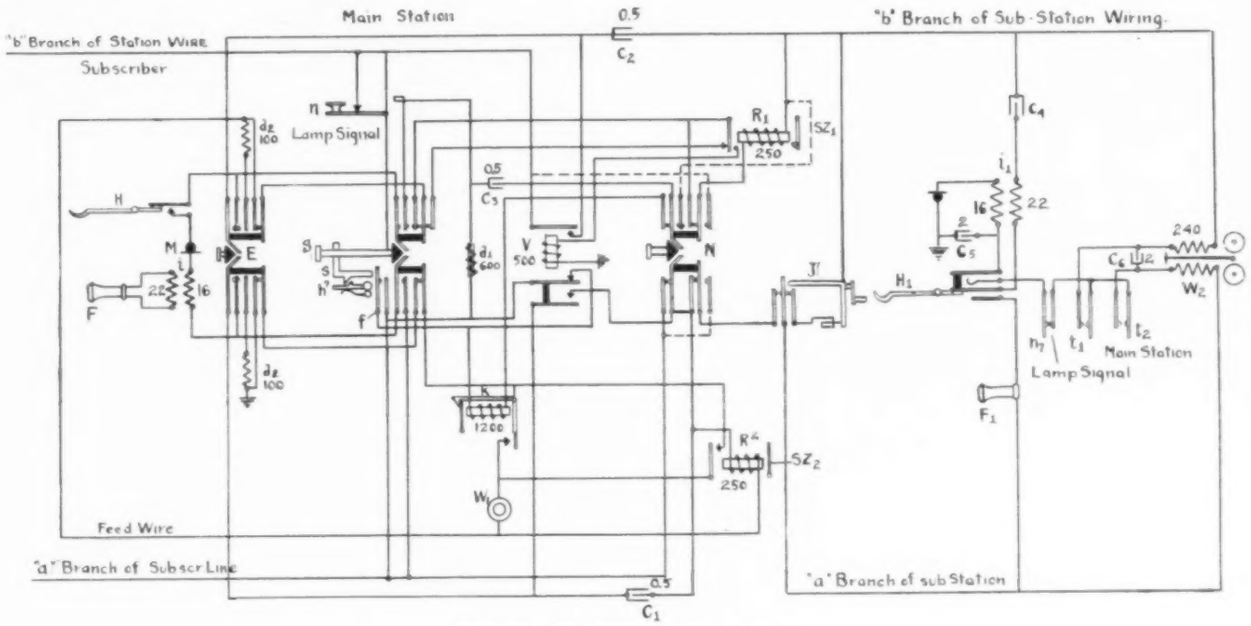
Experiments with a wireless telephone between the battleships Veribe and Justice showed that communication could be carried on perfectly for a distance of 69 miles. When attempts were made to interfere by nearby warships, emitting the most powerful etheric waves, communication remained excellent for a distance of 18 miles.

Digest of Foreign Telephone Literature

Translated for Our Readers

POLE CHANGER OF NEW DESIGN.

IN telephone and signal service a great number of elements come into consideration. The calling magneto, in which current is generated by turning the crank, is very inconvenient, and many stations use pole changers. The following describes a new German pole changer. The main feature of this pole changer is an electromagnet with an armature of soft iron, which is in the shape of a pendulum. When the circuit is closed, single sharply defined induction currents are formed at the closing and opening of the circuit by the automatic cut-outs which are fastened to both sides of the electromagnet armature. A small transformer associated with the mechanism gives alternating current. The important thing is the pendulum, which must not exceed a certain number of swings. In this construction, the movements of the pendulum can be regulated by changing the position of both magnet spools, so that the armatures shall not make more than 15 to 20 regular swings per second. To obtain a sparkless operation of interrupter contacts, and prevent burning of contact springs, condensers are placed in parallel with the magnet spools.—*Elektrotechnischer Anzeiger.*



Main and Sub-Exchange Wiring Diagram.

NEW MICROPHONE FOR DEAF PEOPLE.

A new microphone for deaf people, which is said to reproduce the voice perfectly, has been placed on the market by the Societé Industrielle de Telephones of Paris. The device consists of three parts connected by a fine wire, namely a transmitter, a receiver, and a battery. The transmitter is a microphone with a double diaphragm, in which the outer, taking up the sound waves, acts on a smaller one, which in turn presses on the carbon grains for varying the electrical resistance. This transmitter is either laid flat on the table or else hooked on the belt or button hole, when in action. The receiver is of the usual type, but has an important innovation. By means of a small pointer on a dial on the face of the receiver, the sensitiveness of the instrument can be regulated so that the voice of the speaker is heard at any desired intensity. There are five divisions of loudness and a zero mark, at which the current is interrupted, and which cuts the battery out when not in use. The battery consists of two cells, and the entire instrument is of convenient size and is hardly noticeable when in use.—*Elektrotechnischer Anzeiger.*

WIRING FOR TELEPHONE MAIN SERVICE WITH ONE SUB-EXCHANGE.

The plan to wire sub-exchanges of telephone systems in such a way that they can connect with subscribers without connecting to the main exchange can be used especially well where common battery is used, and where there is only one sub-exchange. The figure shows a main exchange and sub-exchange wiring diagram in which feeder current can be conducted to the sub-exchange microphone *M*, which is grounded at one side from any feed wire at the main exchange over *a* or *b* branch of the sub-exchange wires, according as key *t1* or *t2* pressed down.

Choice between current wires is made possible because the windings of alarm or bell *W2* are separated from each other by condenser *C2* as regards flow of direct current. In the figure it is supposed that the source of current is a feed wire connected to the exchange battery. But a battery placed at the main ex-

change could be used just as well. The current supply of key *t* goes over relay *R1* of main station; that of key *t2* over relays *R2*. The relays *V*, which is grounded on one side, is connected with working contact *R1* in such a way that the call is made as soon as the armature of *R1* is pulled, and the wires of the subscriber's system are connected to the sub-exchange wires, as *R1* has the current circuit closed. The current over *a*-wire is used for connection between main and sub-exchanges, that over *b*-wire for connection between sub-exchange and subscriber's telephone; *i. e.*, the sub-exchange in the second case is independent of the main exchange.

Both sets of apparatus are therefore designed as follows:

The installation at the main exchange has three switchboards: *A* for connection of main exchange and subscriber; *E* for connection of main exchange and sub-exchange; *N* for permanent connection of sub-exchange and subscriber. The three switches are in the form of pressure keys. To *A* belongs a pair of springs *f*, whose pressure part *s* is taken along by the shaft *S* when pressed down, till it snaps in position in the notch of lever *h*, which is controlled by a spring. Together *f* and *s* are called sub-switches of *A*.

A, *S*, *E*, and hook switch *H* are coupled to each other mechanically. If pressure key *E* is pressed down, it is released by subsequent pressing down of *S*. If, however, *S* with *s* is pressed down, subsequent pressing down of *E* releases *S*, not *s*. That is, *A* comes into rest position, *f* remains in working position, and *s* can be released by moving *h*, so that *f* also comes to rest. All these operations are only possible if receiver *H* is taken from its hook. If *H* is pressed down, either *A* with *S* and *f* with *s*, or *E* return to position of rest, according to the momentary position of switches. Keys *w* of main exchange, and *w* of sub-exchange can call up the subscriber and ask for connection by so-called flicker signals.

1. *Subscriber calls*:—Telephone drop *K* falls, direct current bell *W* rings, *K* is raised and *F* removed from *H*, and *S* and at the same time *s* pressed down. Choking coil *d* is placed in circuit by *f*. The subscriber calls the sub-exchange. *E* is pressed down, in order to switch *M*, *i*, and *F* into sub-exchange circuit. *S* with *A* comes into rest position, *s* remains, and *d* keeps current circuit of subscribers line closed.

The sub-exchange is called by crank *J*. Sub-exchange removes *F1* from *H1*, switches *t2* into circuit, upon which *R2* calls, and signal *Sz2* connected with *R2* appears. Sub-exchange is requested to speak to subscriber. *F* is hung up on *H*, *E* and *s* are released, and *t1* is switched into circuit, when *t2* returns to rest position. *R1* and *V* call, the signal *S2* of *R1* appears and *d1* is switched over *V* to subscriber's line to suppress exchange pilot signal, while sub-exchange speaks to subscriber. When *F1* is hung up on *H1*, the connection sub-exchange subscriber is disconnected automatically.

Main exchange calls sub-exchange:—*F1* is removed from *H1*, *E* pressed down and *J* turned. Sub-exchange responds after switching *t2* into position. At the main exchange *Sz2* is visible, but *W1* cannot call, as circuit in *E* is broken. Nor can the exchange be troubled by wrong connection of *t1*, because *R1* and *V* are disconnected from current source in *E*. Position of rest is reached again by hanging up *F* and *F1*.

Sub-exchange calls main exchange:—*F1* is removed from *H1*, *t2* is pressed down, *R2* calls, *Sz2* appears and *W1* rings, till *E* is pressed down. Main exchange releases sub-switch *A* (*s* and *f* with *d*) by moving *h*, when changing from subscriber's to sub-exchange connection.

Sub-exchange connects with subscribers:—*F1* is removed from *H1*, *t1* switched into circuit, *R1* and *V* call and *Sz* appears as busy signal in main exchange. The rest of the operation is like that described in the first connection. If main exchange is already connected to subscriber's line, and *t1* is placed into circuit, *R1* remains over its own rest contact near current supply, and acts as a sort of automatic cut-out, the buzzing in *F1* showing busy line.

Permanent connections are made by turning over *N*, by which operation *R1* and parallel to it *C3* are switched into *b*-branch of wires. *Sz* here also shows when wire is busy.

The main advantage of this system is that, in contrast to series connections, all calls can be answered by main and sub-exchange lines without help of special call lines.—*Elektrotechnische Zeitschrift*.

TESTS OF TELEPHONE AND ELECTRIC CABLES AND WIRES FOR MAINS.

The tests were to determine the general requirements and the value of existing standards for telephone and electric wires and cables for general use and especially on board ships. Tests were made for:

1. Effect of bending cables over drums of various diameters.
2. Effect of heat on insulation.
3. Heating of cables under influence of passage of current.

The results obtained on the first series of tests for bending were as follows: Cables were tested by being bent back and forth over drums of various diameters, ranging from two to three times the diameter of the cable. The pliability of the cable when under a very small radius of curvature does not alter the insulation of new cables. But this is not the case with cables which have undergone a series of heat effects. Here the indications point to the option that the insulation of the cable, when bent short, changes, as if the various strands of the wires had undergone a change. But in spite of this it seems that the regulations which demand that a cable should not be bent over an angle which is more than five times its external diameter are satisfactory.

Action of temperature on insulation.—A number of cables were kept at a temperature of 100 degrees centigrade during 170 hours, and then tested. All resisted a test of at least 7,000 volts. When the cables were bent, it was found that the rubber insulation was torn, the tears increasing in layers, and the ruptured cables hardly stood a test of 150-200 volts. This shows that a temperature of 100 degrees for 170 hours injures the cable.

Then the action of temperatures on cables at 150 volt tests was watched. A cable of 1 mm² 18, which had given 3,500 megohms per km. before heating, gave 12,000 megohms after heating it at temperature of 55 degrees for 1,000 hours. After twelve hours of rest this cable was compared with a cable of 10 mm² 46 which had not been heated. The insulation of these two cables, equal to 4,300 and 9,000 megohms respectively before heating was found equal to 4,600 and 6,900 megohms respectively after heating to 75 degrees for 170 hours.

On the strength of these and former experiments, one must conclude that the temperature of 50 degrees

for permanent temperatures in mains should not be exceeded. The temperature in the mains is equivalent to the temperature of 35 degrees in open air. If we consider the results of the experiments at 55 degrees and 75 degrees we might take a temperature of 60 degrees to be reasonable for these cables. The standards prescribe a temperature of 60 degrees for cables and wires which carry current at intervals only, as those for telephones, discharge of guns, searchlights, etc., and 75 degrees is allowed for cables used in exceptional and emergency cases as in case of danger. The temperature of 75 degrees seems to be safe however for all cables, and the wires overhead being exposed to the air, the temperature will be decreased.

Heating Tests.—In the third series of tests the heating effect of current passing through cables was investigated. Insulated cables of the same cross section and type as the bare cables and wires resisted the tests in a less degree than the latter. This does not contradict the general admission that bare wires can carry more current than covered wires. The former can easily stand temperatures of several hundred degrees, whereas the rubber insulated cables can hardly stand 100 degrees. Furthermore, in the bare wires the admissable current is only limited by economy and not by heat considerations.

The tests have also shown that a bright bare wire is heated quicker than a blackened wire, and that covered wires and cables installed so that they touch a metal surface are heated less than a cable suspended in the air, provided the temperature in the conduit is that of the atmosphere. It is difficult to account for this fact; nevertheless, the reduction of heat is considerable. In the cables and wires suspended in air, tests showed that in temperatures from 10 to 35 degrees, the actual capacity of telephone cables up to 100 to 200 mm. cross section can be exceeded beyond the limits now set, but that in high tension cables the limit ought to be reduced. The tests have also called attention to a very important fact relating to the caloric inertia of the cables and wires. In electric wiring on board ship with insulated wires, it was found that they reach their maximum temperature only very gradually, thanks to the initial caloric inertia which is increased by the presence of the conductors, insulations, and coverings. The caloric inertia of a bare wire was found to be much lower than that of a covered wire. To recognize the importance of this caloric inertia in heat effects, it is only necessary to point out that an increase of 20 degrees in temperature is equivalent to an overload of 540 amperes in a cable of 1,200 mm. cross section.—*Memorial du Génie Maritime.*

Enameled Wire.—For a long time experimenters tried to make a non-hygroscopic, thin wire with small heat resisting insulation. Only in the last few years have these experiments born fruit, and now there are two ways of reaching the desired result. The one is, to cover wires, like aluminum, with a very thin coating of some non-conducting oxide; the other is, covering the wire with an enamel. The difficulties in the latter case were with the drying methods and the making of a good enamel solution. Recently the Allgemeine Elektricität Gesellschaft put an enameled wire on the market. As a conductor soft copper wire is used. The coat of enamel is very thin, dark brown and of brilliant luster. The wire is very pliable and can be wound about a stick three times its own diameter. The insulation is unaffected by moist air, as it is not hygroscopic. But wire cannot be laid in water as sometimes little particles of dust form in the enamel which are harmless in air but give rise to leaks in water. Final permissible temperature is 100 to 120 degrees, and in case of short overloads even 150 to 200 degrees. This gives greater scope for economy in winding wire. But one of the drawbacks is that more expansion and contraction takes place in this wire, and that there is no elastic web to equalize this force as is the case in the covered wires. Therefore, coils whose highest temperature will exceed 30 degrees C must not be wound in too numerous layers of this wire, and the thickness of winding should never exceed one-half the diameter of the core. —*Deutsche Mechaniker Zeitung.*

NEW NICKEL-IRON ACCUMULATOR.

The *Elektrotechnische Zeitschrift* brings out the construction of a new nickel-iron accumulator designed by Gouin. The positive plates of 540 g (16.2 oz.) weight, and 37 ampere-hour capacity are made of 29 tubes of nickel-iron, in which the active material is stored, and which are wound by nickel wire. The negative plates are formed of iron strips, placed in a frame, and coated with an easily reduced oxide. This weighs 140 g. (4.2 oz.), and has a capacity of 15.4 ampere-hours. The accumulator has five positive plates and six negative double plates. Fully charged the tension is 1.55 volts, and in discharging with 20 amperes it decreases from 1.45 volts in the first hour to 1.2 volts. After two hours the loss is 0.2 volts per hour; after six hours it is down to 0.8 volts. Capacity is therefore 120 ampere-hours; 130 watt-hours, with 6.25 kg. (13.75 lb.) weight of accumulator, i. e. 21 watt-hours per kg. (2.2 lb.).—*Elektrotechnische Zeitschrift.*

CONSTRUCTION OF AUSTRIAN GOVERNMENT LONG DISTANCE TELEPHONE LINES.

The Austrian government which builds the long distance telephone lines in Austria uses very strong bronze wires for overhead transmission lines. But it is not the choice of wire alone that has brought such good results in this system, but other construction standards which were carefully planned and made as modern in every way as possible.

In constructing the main lines, overhead transmission has been used as much as possible, and even very short interruptions of this transmission for underground conduits have been avoided. As regards the type of wire, this has been kept uniform as much as possible, for it was found that the use of thinner wires for small communities and side lines detracts from the advantages gained by using the heavy wire on the main lines. Where it was found impossible to use the heavy wire, the main lines were led around the community in question by a circuitous route rather than use thinner wire. Only in extreme cases wire of 3 mm² was used.

Special attention was also paid to the installation of examining and testing stations all along the lines. The practice of connecting a large number of test stations into the main line has been avoided as much as possible. Where testing stations were found necessary, four wire test loops were installed so that the stations need only be connected temporarily when actually necessary. To make these connections, branch sleeves of special design were installed in main lines between double posts, as was also done at regular intervals on main lines to find trouble in case of disturbances. To increase the security of the sleeve con-

tact, special contact and tension springs were attached, so that a loosening of electric connections through swaying of poles is almost impossible. To connect wire ends, copper shells were employed with success. Where overhead wires were led underground, single strand rubber covered cables with good insulations were used. To avoid increase of resistance as much as possible, weaker copper conductors of only 2 mm. were used in place of the usual ones.

A special entering insulator with insulated stuffing box eliminated danger of leakage of current where overhead wires entered underground conduits.

In the case of lightning conductors, the simple split contact connections have been strengthened by screws. As fuses for feeble circuits, heating coils are not used on account of their great resistance, but only very short fuse wires which fuse at 0.5 ampere. To conduct main lines to central transformers, rubber insulated lead covered cables, with conducting wires 2 mm. are used. The connections of all the wires with switchboards and exchange apparatus is accomplished by small tinned wire shoes which are soldered to ends of wires, screwed to wire clamps of apparatus and then again soldered. The long distance connections in the exchanges are made by multiple jacks. In the intermediate exchanges, such long distance calls are connected by these jacks, so that the calls need not be run over connecting cords, which increases the efficiency of the system greatly. As call signals in such stations, call bells of high resistance and high self inductance are used, and in end stations, either bells or drops.

The main lines are always used as closed circuits, so that the smaller lines or subscribers' lines may not interfere with the strength of sound transmission for long distance calls. Connections of subscribers' lines and interurban lines are made by using sub-switches.—*Elektotechnik und Maschinenbau.*

Poles Purchased in 1909

The total number of poles reported to the Bureau of the Census as purchased during the calendar year 1909 by the telegraph and telephone companies, steam and electric railways, and electric light and power companies of the United States was 3,739,000, as against 3,249,000 in 1908 and 3,283,000 in 1907. There were purchased in 1909 by the same class of users 3,509,000 cross-arms, 6,168,000 brackets and 18,463,000 insulation pins. Cross-arms, brackets and insulator pins were not included in the annual census of lumber and timber products prior to 1909.

This information appears in a preliminary comparative report covering 1909, 1908, and 1907, transmitted this week to Census Director Durand by Chief Statistician William M. Steuart, under whose supervision it was prepared by J. E. Whelchel, expert special agent of the Division of Manufactures. In cooperation with the Forest Service of the Department of Agriculture the Bureau of the Census annually collects and publishes statistics pertainng to the group of lumber and timber industries.

Telephone and telegraph companies reported purchases during 1909 of 2,916,000 poles, or 78 per cent of the total. This was an increase over 1908 in the number reported as bought by this class of users of 354,000 poles, or 14 per cent, and over 1907 of 604,000 poles, or 26 per cent. Steam railroads reported the purchase of 26 per cent more poles in 1909 than in 1908, though 34 per cent less than in 1907, while the reported purchases by electric railways and electric light and power companies were 18 per cent greater than in 1908 and 7 per cent less than in 1907.

There was little change in the average cost per pole of all lengths and from all species of wood in 1909, as compared with 1908, it being $1.89 in the later and $1.82 in the earlier year. The average cost per pole, $2.46 in 1907, was substantially larger than in either of the later years, mainly for the reason that a class of pole consumers in the United States which uses chiefly short poles was not included in the census for 1907.

THE SUMMARY OF POLES PURCHASED.

Kinds of	1909		1908		1907	
Wood.	Number.	Cost.	Number.	Cost.	Number.	Cost.
Cedar	2,440,000	$4,680,000	2,200,000	$3,781,000	2,109,000	$5,203,000
Chestnut	608,000	1,383,000	516,000	1,227,000	630,000	1,620,000
Oak	237,000	137,000	161,000	95,000	76,000	60,000
Pine	180,000	520,000	117,000	383,000	156,000	460,000
Cypress	78,000	117,000	91,000	148,000	100,000	308,000
Juniper	44,000	79,000	42,000	83,000	39,000	109,000
Tamarack	30,000	18,000	24,000	32,000	14,000	10,000
Douglas fir	25,000	35,000	20,000	80,000	16,000	41,000
Redwood	23,000	49,000	13,000	39,000	31,000	109,000
Bois d'Arc	21,000	9,000	18,000	11,000	6,000	3,000
Spruce	11,000	18,000	8,000	23,000	11,000	29,000
Locust	10,000	9,000	10,000	8,000	5,000	4,000
All other	32,000	19,000	29,000	18,000	89,000	126,000
Total	3,739,000	$7,074,000	3,249,000	$5,929,000	3,283,000	$8,082,000

Cedar continues to be the principal pole timber, contributing 65 per cent of the total purchases in 1909, 68 per cent in 1908 and 64 per cent in 1907. Chestnut, after cedar, was used in greatest quantity in all three years, forming 16 per cent of the total in 1909, 16 per cent in 1908 and 19 per cent in 1907. Among the remaining species, the increase in the number of oak poles reported as purchased during the last three years is noteworthy; more than three times as may poles from this species were reported as purchased during 1909 than was the case in 1907.

Substantial progress in the practice of treating poles with chemicals to preserve them from decay is disclosed by the returns for 1909, nearly one-sixth of the total purchases during that year having had some preservative treatment, as against about one-tenth in 1908 and one-eighth in 1907.

Of the total outlay during 1909, $1,621,000, for cross-arms, brackets and insulator pins, the telegraph and telephone companies contributed 63 per cent, electric railroads and electric light and power companies 32 per cent and steam railroads 40 per cent.

When the Chicago Subway Telephone Construction Company opens its telephone service to the public on January 1, it will start operations with approximately 33,000 subscribers on its books, which is 13,000 more than would have been required by June 1 next in order to save its franchise.

Now that the telephone system has progressed somewhat it is likely that the reorganization committee will take up the matter of the financial reorganization of the Subway Company and the Illinois Tunnel Company.

Several plans are under consideration, and one of them is understood to be the elimination of the now outstanding $36,000,000 five per cent bonds, giving non-cumulative preferred stock on the basis of 80 in exchange therefor. The present stock would be scaled somewhat and an assessment made of not more than $10 a share.

Development of the Industry

Extract from the Census Report

AT THE close of 1907 the amount of wire in use by telephone systems of the country exceeded that in use in 1902 by more than 8,000,000 miles, and the other leading items showed proportionately large increases. It is especially interesting to learn that the industry gave regular employment to 65,417 more persons in 1907 than it did five years earlier, and that the amount expended in salaries and wages was greater by $32,023,506 in 1907 than in 1902.

Until recent years the field of operation of a telephone system was restricted to a comparatively small area, but the introduction of the long distance lines and the arrangement for toll service between neighboring companies have made communication possible between widely separated sections of the country with a facility which of itself has contributed to increase the business of the industry.

Naturally the most extensive equipment and the greatest amount of business are found in the states that have the largest population.

The gains in equipment and service, however, were large for each of the geographic divisions and the rates of increase (except in the Western division) were comparatively uniform, as shown by Table 1.

TABLE 1.
PER CENT OF INCREASE

Division.	Miles of wire.	Stations or telephones.	Messages or talks.*
United States	165.3	158.1	124.3
North Atlantic	142.7	156.2	116.6
South Atlantic	166.8	149.2	134.0
North Central	160.5	160.0	119.5
South Central	179.4	157.0	121.6
Western	293.8	160.5	175.1

*Statistics for messages or talks on independent farmer or rural lines not included.

The industry is largely concentrated in the populous North Atlantic and North Central states, and the greatest amount of increase between the years 1902 and 1907 in wire mileage, telephones, and business is shown for these states. More rapid rates of increase occurred in other sections, however, and the largest percentages of gain for wire mileage are shown for the Western, South Central, and South Atlantic states, where, as a rule, the telephones are farther apart than in the other divisions. The Western states had the largest percentages of increase also in the number of telephones and messages or talks. In accepting the percentages of increase the relative size of the totals involved should be given due weight. Between 1902

Fig. 1. Average Population per Telephone, 1907.

Fig. 2. Average Population per Telephone, 1902.

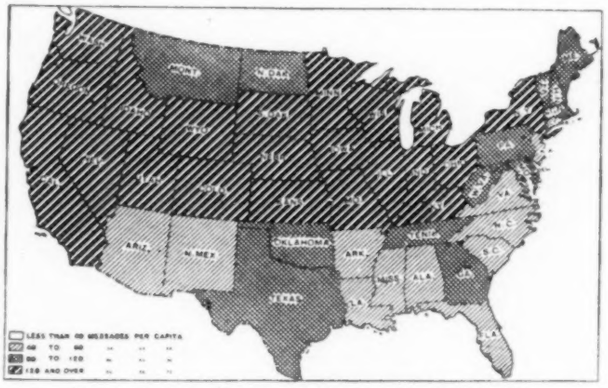


Fig. 3. Average Number of Messages per Capita, 1907.

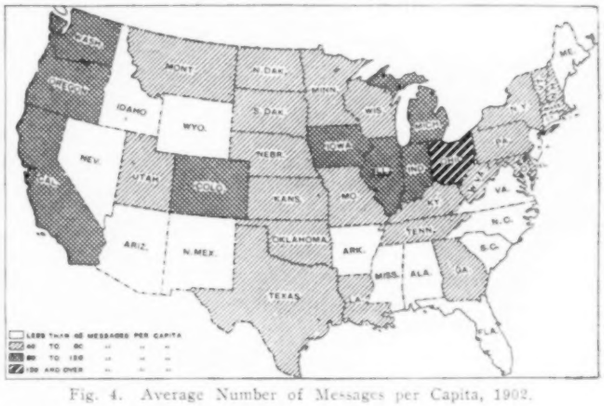


Fig. 4. Average Number of Messages per Capita, 1902.

and 1907 New York had the greatest increases in the number of telephones and in the miles of wire, the gains being 438,172 and 1,006,451, respectively; whereas the corresponding increases for the entire Western division, 332,854 telephones and 898,411 miles of wire, are less than those for the single state of New York. Yet the rate of increase for telephones in the Western division is nearly equal to that for New York state, the rates being 160.5 per cent for the division and 177.2 per cent for the state; while the rate of increase for miles of wire in the Western division, 293.8 per cent, far exceeds that for New York state, 161.4 per cent. In 1907 eleven states had over 200,000 telephones each, while in 1902 only three states—New York, Ohio, and Illinois—had this number. Table 2 shows the states having 200,000 or more telephones in 1907, the number of telephones which each of them had in 1907 and in 1902, and the per cent of increase for each between the two dates.

TABLE II.

NUMBER OF STATIONS OR TELEPHONES.

State.	1907.	1902.	Per cent of increase.
New York	685,512	247,340	177.2
Illinois	558,585	221,008	152.7
Ohio	495,636	224,083	121.2
Pennsylvania	450,403	186,734	141.2
Iowa	332,545	138,400	140.3
Missouri	312,527	103,155	203.0
Indiana	289,452	136,561	112.0
California	237,672	106,650	122.9
Michigan	209,842	95,415	119.9
Massachusetts	209,383	96,512	117.0
Kansas	200,233	41,193	386.1

The rate of increase was particularly large in the case of Kansas. The other leading states in order of proportionate increase are Missouri, New York, Illinois, and Pennsylvania.

Notwithstanding the large absolute increases in the North Atlantic and North Central divisions, the relative importance of these groups of states in the industry was the same in 1902 and 1907. The percentages indicate that the development in all sections of the country has been at a nearly uniform rate. There is, however, a slight tendency for the relative importance of the North Atlantic and the North Central divisions to diminish, but this has resulted in little change in the proportions of the number of telephones, miles of wire, and the number of messages or talks pertaining to the different geographic divisions at the two censuses.

The relative importance of the states east of the Mississippi River has declined somewhat during the five years. In 1907 they contained 8,952,123 miles of wire and 3,984,560 telephones, or 68.9 and 65.1 per cent, respectively, of the totals for the entire country; while in 1902 they contained 3,769,436 miles of wire and 1,648,896 telephones, or 76.9 and 69.5 per cent, respectively, of the totals.

The states east of the Mississippi River and north of the Ohio, including the states north of the Mason and Dixon line in 1907 contained 7,362,079 miles of wire and 3,375,562 telephones, or 56.6 and 55.2 per cent, respectively, of the totals for the entire country; in 1902 they had 3,136,325 miles of wire and 1,389,280 telephones, or 64 and 58.6 per cent, respectively, of the totals.

The above series of maps illustrates the number of inhabitants per telephone and the number of messages per capita. Maps 1 and 2 distinguish the states with 50 or more inhabitants per telephone in 1907 and 1902, respectively; those with 30 but fewer than 50; those with 10 but fewer than 30; and those with fewer than 10, the last class representing the states of highest development. In like manner Maps 3 and 4 show the states reporting fewer than 40 messages or talks per capita in 1907 and in 1902; those with 40 but fewer than 80; those with 80 but fewer than 120; and those with 120 or more, the last class representing the states of highest development.

The Inventors' Guild.

During the early part of the present year a number of men interested along the line of invention and realizing the difficulties of the inventor and the disadvantages under which he labors in developing and patenting his invention, formed in New York City an organization to be known as the Inventors' Guild. Its purpose is to promote the application of the useful arts and sciences, to further the interests of inventors and secure full acknowledgment and protection for their rights.

The inventor is subject to many handicaps, among which are lack of sufficient funds; delays in the Patent Office, due to lack of proper facilities to expedite the work; expense and tardiness of litigation, and the possibility of prolonging a suit, thus increasing the expense to a point which places such suit beyond the reach of the poor inventor; the disadvantages of an American inventor in foreign countries as compared with a foreign inventor in America, all of which it is the purpose of the Guild to remedy.

Realizing that a small organization can accomplish better and more speedy results, the membership is limited to fifty, and great care is exercised in the selection of members, the object being to include not only men who have made inventions, but who have achieved some measure of success in connection therewith and who will be capable of exerting some influence and will also be congenial to the entire membership.

The officers of the Inventors' Guild are: Ralph D. Mershon, president; Charles W. Hunt, first vice-president; Charles S. Bradley, second vice-president; Thomas Robins, secretary, and Henry L. Doherty, treasurer. The board of governors are: Ralph D. Mershon, Leo H. Baekeland, Charles W. Hunt, Charles S. Bradley, Michael I. Pupin and Peter Cooper Hewitt. The professional committee are: F. L. O. Wadsworth, chairman; Thomas A. Edison, Charles S. Bradley, Peter Cooper Hewitt, Michael I. Pupin and Bion J. Arnold.

The Guild has twenty-nine charter members, as follows: Bion J. Arnold, Dr. L. H. Baekeland, W. H. Blauvelt, Charles S. Bradley, Alexander E. Brown, Henry L. Doherty, Thomas A. Edison, Charleton Ellis, Stephen D. Field, James Gayley, Edward R. Hewitt, Peter Cooper Hewitt, Charles D. Mershon, Am- John F. Kelly, T. S. C. Lowe, Ralph D. Mershon, Ambrose Monell, Prof. Edwin F. Northrup, Prof. G. W. Pierce, Charles E. Pope, Prof. Michael I. Pupin, Thomas Robins, Dr. F. Schniewind, C. H. Smoot, Prof. Carl Thomas, F. L. O. Wadsworth, Arthur West, Dr. W. E. Winship and B. F. Wood.

The Law and the Telephone

By E. J. Wenner

NAME OMITTED FROM DIRECTORY—DAMAGES.

N. C. VAN SANT, a resident of Stirling, Illinois, filed suit against Central Union Telephone Company of that city demanding $200 damages for the reason that the company omitted his name and number in its regularly published directory of subscribers. He claims to have called the attention of the company to the omission of his name and number, but that no attention was paid to his complaint. He also claims the absence of his name and number from the directory resulted in a loss of business. On December 2d he was given a judgment for $10.

This is the first case known in the United States in which a party has recovered damages on account of his name and number being omitted from the telephone directory.

TELEPHONE COMPANY RESTRAINED—CASE APPEALED.

A special court in the Court of Civil Appeals in Dallas, Texas, heard the case of Southwestern Telephone and Telegraph Company vs. Rev. J. L. Andrews. The case was tried in the lower court before Judge Kenneth Foree. The plaintiff, Andrews, sought to restrain the telephone company from alleged violations of what are called the initiative ordinances. The lower court allowed a restraining order, and from this judgment the telephone company appealed.

SPECIAL MASTER'S FEE—$8,000 ASKED.

Henry Burnett, special master in the case of Cumberland Telephone Company against the City of Louisville, in which the telephone company seeks to resist the rate reduction ordinance passed in the administration of former Mayor Grinstead, has filed his report of expenses in the Federal Court.

The report shows that he expended the sum of $365 for stenographic and other expenses and asks for $8,000 as special master's fee. Mr. Burnett sets forth in his report that he was appointed master in March, 1909, that his duties have been arduous and that he feels that he is entitled to $8,000 for his services.

It is probable that if the findings of Mr. Burnett are upheld the telephone company will have to pay all the expenses in the case.

The Cumberland company is preparing to file exceptions to the rulings of the special master. The exceptions will be filed in about two weeks and the matter will be argued before Judge Evans in the United States Court.

ACTION TO REQUIRE INSTALLATION—PATRONS' DEMAND.

The Home Telephone Company of Vicksburg, Mississippi, has at the request of some of its patrons, petitioned the Mississippi Railroad Commission to compel the Illinois Central Railroad, the American and the Southern Express Companies to put in the Home telephone.

The corporation has refused to make connection with this company and it will be interesting to watch the outcome of this case.

The matter was up for consideration before the last meeting of the commission, but it was not definitely decided that the commission had the power to compel any corporation or person to make telephone connections.

The Home Telephone Company intends to push the case in every possible way and to require the corporations to install, if it can be done.

TELEPHONE COMPANY VICTORIOUS—SUPREME COURT OVERRULES LOWER COURT—$225,000 FINE GOES GLIMMERING.

It will be remembered that a suit was instituted in Lauderdale county, Mississippi, to oust the Cumberland Telephone and Telegraph Company from the state. The action, which was brought under the so-called anti-trust laws, resulted in the court fining the defendant $225,000 for violating the state statutes. Recently this case was considered by the supreme court, and the decision of the lower court was reversed and the case dismissed from the docket.

The case was reversed on the theory that when the company, in the trial below used its own books and records, and allowed the state to use them, it was entitled to immunity from punishment. This seems sound law under the existing conditions in that state.

A Mississippi case started by the state against the Hines Lumber Company, under the so-called anti-trust laws, will no doubt be dismissed or settled soon. The decision in the Cumberland case above referred to will have much to do with the dismissing of this action, if the attorneys for the state decide that the action can not be successfully maintained after the company turns over its books to the state to be used by it in prosecution.

ATTORNEY-GENERAL'S INTERPRETATION OF CUMBERLAND DECISION.

Attorney-General Hudson of Louisiana, in speaking of the recent supreme court decision in the Cumberland case, said that if it were allowed to stand it would weaken the officers of the state in their enforcement of anti-trust statutes. He is at work on a suggestion of error in which he will undertake to define the position of the president of the Cumberland Telephone and Telegraph Company, who was on the witness stand during the trial. He contends that the president was and is a volunteer, and that he was not subpœnaed with instructions to bring books, papers and records of the office to the witness stand, and that where volunteer testimony, given by the president is introduced, the statutory provision of the immunity would not and could not apply. The attorney-general views the matter with some concern, and says that under the holding in this case all other defendant corporations in pending cases, either to secure an order of ouster or penalty for violation of these statutes, will be materially strengthened in their resistance. However, he is not confident that he can cause the supreme court to change its view of the case, but will make an effort to do so.

RATES HELD REASONABLE.

Special master Henry Burnett, who was appointed by the federal court to examine into the reasonableness of the rates named by the general council of Louisville, Kentucky, for the Cumberland Telephone

and Telegraph Company, has filed his report. He finds, after careful investigation, that the schedule is not unreasonable and that the rates charged are not confiscatory.

FURTHER DEVELOPMENTS IN NATIONAL TELEPHONE CORPORATION LITIGATION—CONTINENTAL TELEPHONE COMPANY INTERESTED.

Mr. John A. Howard, who is interested in the Continental Telephone and Telegraph Company, which company is now in the hands of receivers, is also interested in the receivership of the National Telephone Corporation. The Continental Telephone Company formerly applied with others for a receiver over the National. Now it appears, with many of the stockholders of the National, and asks that the receivers formerly appointed be dismissed and others be appointed in their stead. The reason for this move is that it is claimed John A. Howard has been connected with the parties concerned and for that reason they should not be retained. The question of appointing independent counsel has been argued to the court. It having been claimed that the allegations of the petition showed that certain counsel in the case were also connected with Mr. Howard as his personal attorneys.

FAILURE TO DELIVER MESSAGE.

Plaintiff instructed the operator at T. of defendant telephone company to call up for him a certain doctor at C. The operator after ringing up C. told him the doctor was at the telephone ready to talk to him. Plaintiff then talked over the telephone with a person at C., representing himself to be said doctor, told him of the condition of his wife, and such person promised to call at once. The person with whom he talked was in fact defendant's operator at C, who had made no effort to reach the doctor. *Held,* that the defendant through such operator had notice of the wife's condition, so as to make it liable for damages.—*Texas Central Telephone Company vs. Owens (Texas)*, 128 *Southwestern Reporter,* 926.

England to Own Telephones.

Americans who have occasion to use the telephone in London, or any other part of the county, are loud in their criticism of the service, comparing it most unfavorably with the system in the large cities of the United States. There is no doubt that it is deplorable, so deplorable that many business men here prefer to employ messengers rather than suffer the wear and tear of temper that the use of the telephone ordinarily involves.

One reason for this state of affairs is found in the circumstance that the National Telephone Company is, the end of next year, to turn its entire property over to the British government. The telephone service will then be run as a public institution under the postoffice department. It is hardly in human nature, it is observed, to pay particular attention to the details of the working of a business that one is soon to lose. In other words, the management of the telephone company at present has little reason to bestir itself.

It is asserted that the transfer of the entire service of the National Telephone Company to the state will be one of the most gigantic operations that the country has ever known. Preparations for it have already begun, and it will, among other things, involve the addition of more than 18,000 persons to the list of civil servants.

On December 31, 1911, the government will take over a company whose stupendous business is indicated by the following table:

Messages handled last year	1,362,000,000
Capital expenditure	$75,000,000
Authorized capital	65,500,000
Annual revenue	17,500,000 to 20,000,000
Subscribers or stations	516,888
Servants	18,200
Exchanges	1,569

The inventory, when completed, will form the basis of the claim which the company will make to the state for the value of its assets, such value having to be determined by arbitration.

The following comment is interesting:

London, Nov. 4.

That tardy annual, the Postmaster-General's report on the post office, for the year ending March 31st, has just made its appearance. A few years ago it was available in August, but it is gradually becoming a Christmas publication.

In view of the approaching creation of an exclusive post office monopoly in the telephone, the financial results of the present telegraph and telephone work of the post office are of interest to business men and political economists. Summarized they are as follows:—

	Capital Expenditure.	Gross Revenue.	Working Expenses.
Telegraphs	£18,523,019	£3,166,192	£3,568,303
Telephones	10,138,128	1,391,377	1,026,933
Total	£28,661,147	£4,557,569	£4,595,136

The excess of expenditure over revenue for the year was therefore £37,567.

The working expenditure of the telegraphs was 113 per cent of the gross revenue. The working expenditure of the telephones was 73.8 per cent of the gross revenue. The working expenditure of the combined undertakings was just over 100 per cent of the gross revenue.

All capital charges, on 28½ millions of capital, have to be met from other sources than the earnings of the combined undertakings.

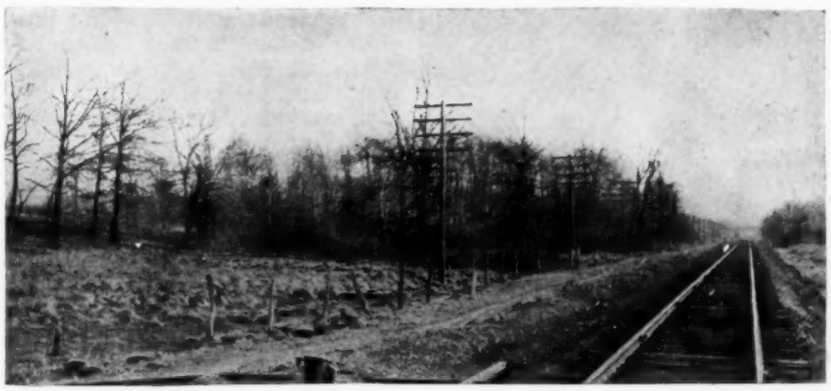
Interest on the original capital of the telegraphs, £10,800,000, is paid out of the consolidated fund. On the capital added since the purchase capital account was closed, many years ago, no interest is paid.

Interest and sinking fund on telephone capital is paid partly by net telephone revenue and partly by royalties from licensees; the royalties for the past year amounted to £320,590, or almost as much as the net revenue of the whole telephone business of the post office.

The actual net telephone revenue, arising from the trunk line system, the London system and the provincial systems of the post office, amounted to £364,444, or 3.55 per cent on the total telephone capital of £10,138,128. The amount required for interest and sinking fund on telephone capital was £767,007, so the net telephone revenue failed to meet capital charges for the year by £402,563.

It is to a department which produces from a technical industry financial results such as these that the political authorities now propose to entrust the entire telephone business of the country.—HERBERT LAWS WEBB.

The New York Public Service Commission, Second District, has received the petition of the New York Telephone Company, asking for approval of the transfer to it of the franchises of The Empire State Telephone and Telegraph Company. The latter company is now operating a public telephone system in the counties of Wayne, Ontario, Oswego, Yates, Cayuga, Seneca and Cortland, and on April 1, 1909, it conveyed all of its property, rights, privileges and franchises to the Central New York Telephone and Telegraph Company, which latter company has been merged into the New York Telephone Company. The capital stock of the Empire Company is $200,000, which the New York Telephone Company now owns.

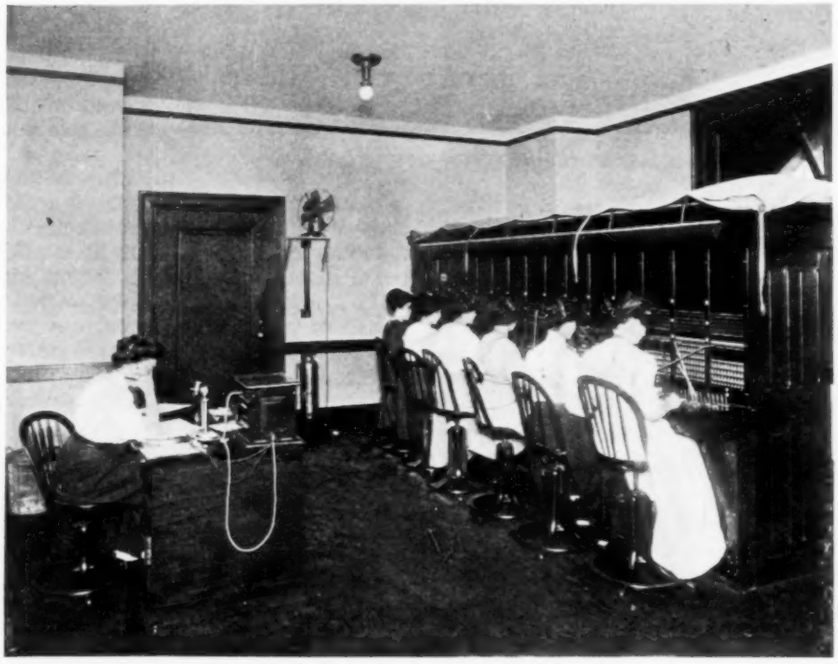


DEPARTMENT of RAILWAY TELEPHONES

Telephones of the Pennsylvania Terminal

Courtesy of the Telephone Review

FROM the time the first spadeful of dirt was turned in 1904 for the construction of the New York passenger terminal and the improvements of the Pennsylvania and Long Island Railroads, the telephone played an important role in the work. With every passing day the value of telephone service became more evident to those who had to do with the monumental task, and during the progress of the work the various contractors and the railroad officials took advantage of every opportunity where time might be saved or expense be reduced by its use.



Private Branch Exchange Switchboard and Supervisors' Desk.

It may be said, therefore, that the progress of the terminal construction and the growth of its telephone system were identical. Step by step they have developed together until at the present time when the great monument conceived by Alexander Cassatt may be pointed out as probably the most perfect in its appointments among the railroad terminals of the world, so can the system which provides for its telephonic needs be regarded as one of the most complete and flexible of its kind.

In order that this telephone system may be understood, it is necessary to get some idea of the terminal, tunnels and yards of the Pennsylvania Tunnel and Terminal Railroad Company, for which its service is required.

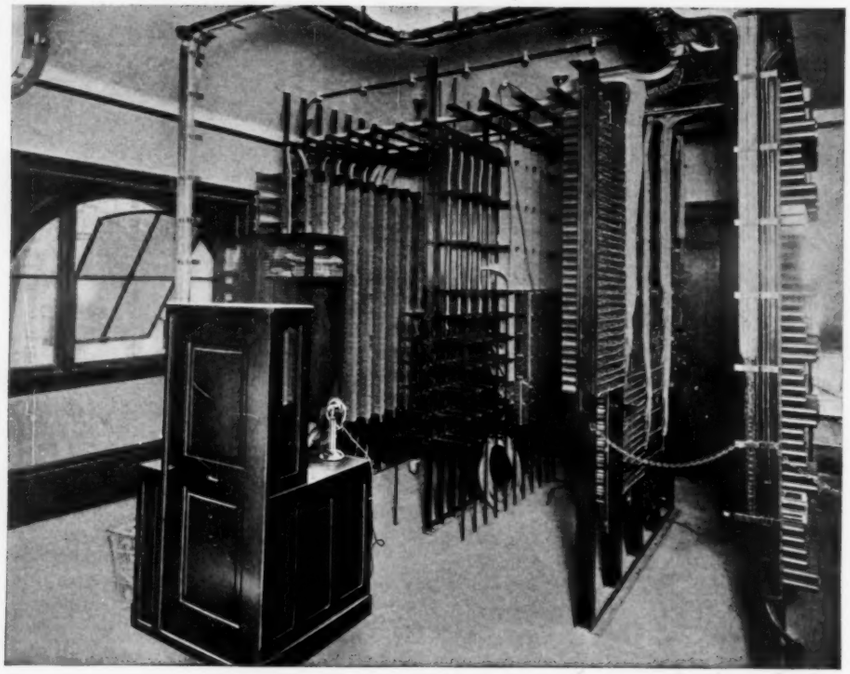
The terminal building itself is not only the greatest of its kind in point of magnitude, but is the largest ever erected at one time, without intervals, on a single contract. The Vatican, the Tuileries and the St. Petersburg Winter Palace are larger buildings, but they have been centuries in construction. The Pennsylvania terminal, covering eight acres of ground, with exterior walls extending approximately one-half of a mile, all told, is unique in having been erected in less than six years' time.

The main entrance to the building is through an arcade with rows of shops on either side. At the end of the arcade a flight of

Department of Railway Telephones

This department is established as a permanent feature of TELEPHONE ENGINEER. The progress of the art of telephone train dispatching, its technical developments, its news, and the elucidation of its mysteries for the non-technical worker will be found each month in these pages. The editors invite the problems and solicit the co-operation of the many readers of TELEPHONE ENGINEER in all parts of the world whose interests lie along these lines.

Telephones of the Pennsylvania Terminal....37-43
Intercommunicating Telephones on Freight Train....43
A Study of Telegraphic Transmission. By Frank F. Fowle....44-45
Intercommunicating on the Lake Shore. By Clifford Weldon....45-46
Telephones on Electric Railways....47-48
Santa Fe Telephones....48
Dispatching Telephones Prove Usefulness....48
E. & T. H. Installs Telephones....48



Terminal Room with Racks and Wire Chief's Desk.

marble steps leads down to the main waiting room. This enormous waiting room with its dome 150 feet above the floor gives one the impression of entering some great cathedral. Under its roof and that of the main concourse adjoining, the population of a town of 50,000 people might find shelter.

The grand concourse is provided with gates leading to all platforms for departing trains, while immediately below on a mezzanine floor passengers arriving in New York pass out through separate exits, thus keeping apart the incoming and outgoing tide of traffic. The station platforms to which lead the maze of tracks shown in the general plan are eleven in number and of 21,500 feet total length, while the total trackage housed within the building exceeds by one mile the entire distance between Harrison, New Jersey, and Sunnyside, Long Island, over which the division extends.

The railroad officials recognizing the peculiar telephonic requirements for the various sections of the terminal as described above, invited the co-operation and advice of the New York Telephone Company in designing the special equipment and apparatus which have been installed.

In overcoming the many obstacles which arose from time to time, new uses of the telephone were devised which, when found to meet the requirements of the case, were incorporated in the permanent system.

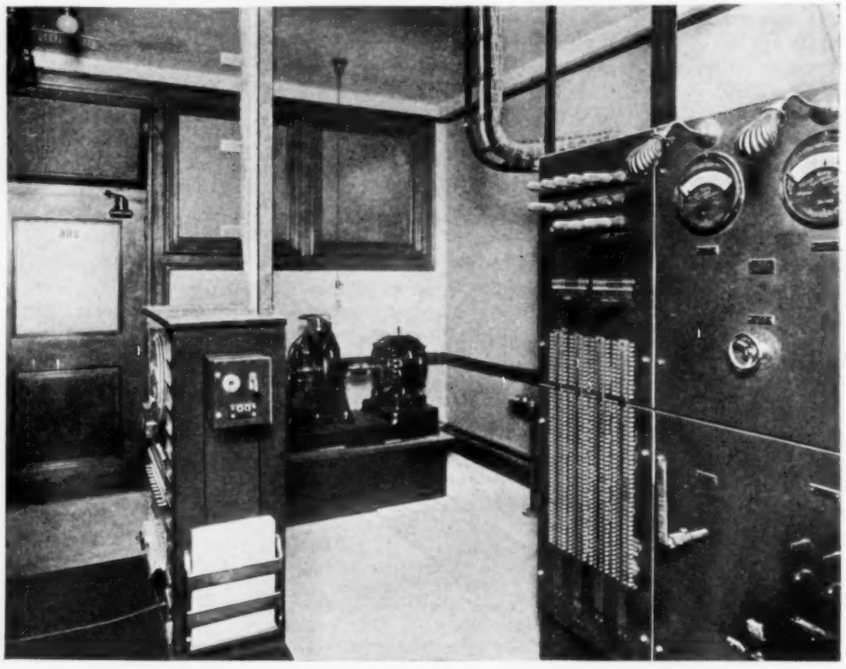
When planning this permanent system the necessity for providing instant communication between all officials and employes throughout the entire division was kept in mind. This covers not only the daily telephonic needs, but also provides for any emergency.

It will be seen that the exigencies of telephone service in such a vast and complicated railway terminal raised special problems which put no little strain on the resources of the telephone engineers.

Although the telephone system comprises three classes of service, namely, commercial, operating and pay station service, nearly all connections, if need be, can be handled from the main switchboard, which is located on the second floor on the Eighth avenue side.

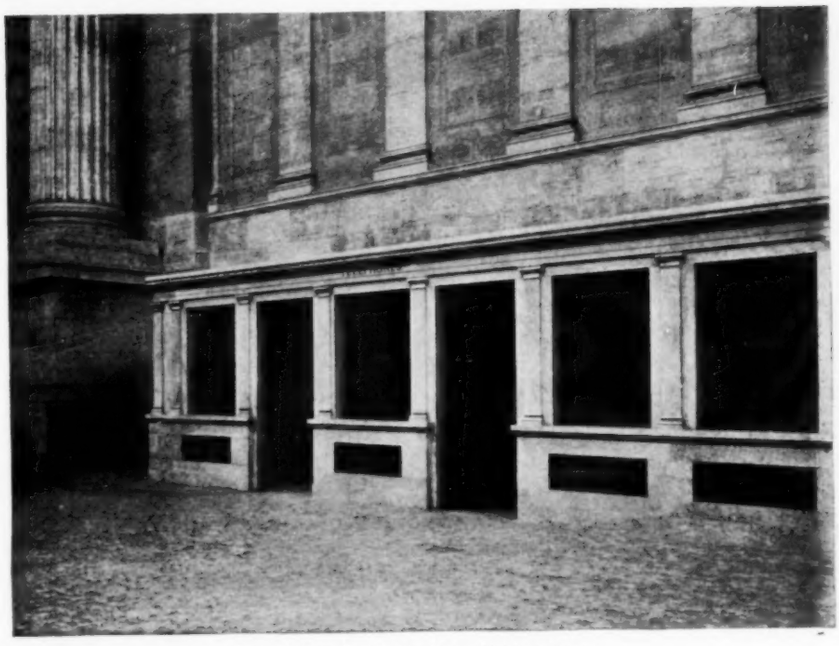
The main board is a Western Electric No. 1 type common battery, and has six operating positions. Each position is equipped with 17 pairs of cords and universal cord circuits are used, making it possible to use either the front or back cords for magneto or common battery connection.

The capacity is 1,000 lines, 200 of which are for trunk or tie lines, 200 are for magneto extensions and 600 for common battery extensions. Two and one-half positions are arranged for handling incoming traffic and three and one-half positions for outgoing traffic. The board is in operation day and night, with a day force of six attendants and a supervisor and a smaller number of attendants during the evening and night.



The System's Power Plant.

The commercial service comprises all of the telephone apparatus located in the various departments of the Pennsylvania tunnel and Terminal Railroad and the executive office of the Long Island Railroad Company (also located in the terminal), which is required for communication throughout the building and for connections to the exchange system of the telephone company. All of the apparatus used for this purpose is of standard type with the exception of a few instruments installed on the station platforms and in the main concourse at the head of the stairways leading to these platforms. At these points, owing to the absence of walls or desks upon which the telephones could be placed or stood, it was necessary to insert in the steel columns small boxes in which were placed the special sets shown in the cut. They are chiefly used for connections between the train conductors and the gatemen while waiting for the departure of trains.



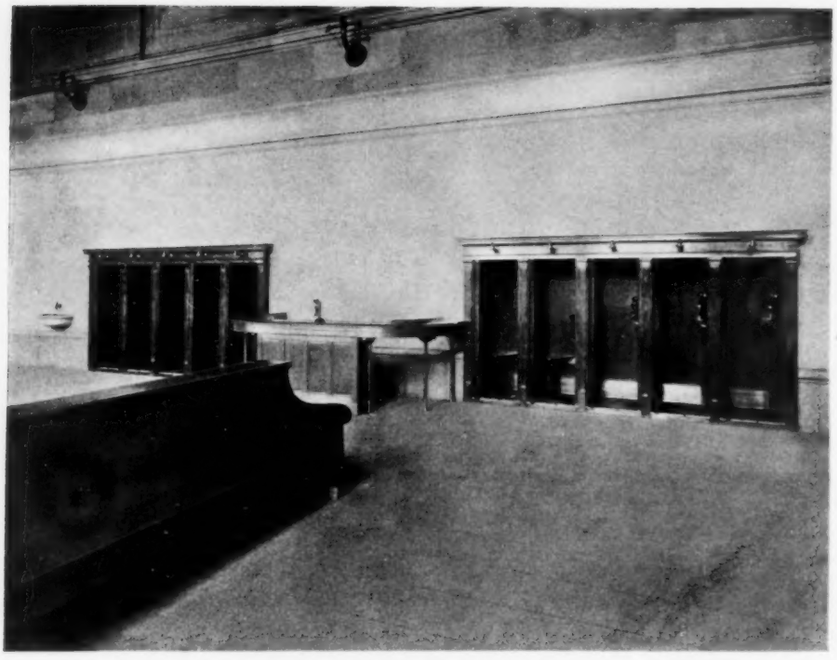
Pay Station Booths in Main Waiting Room.

Included in the commercial service is a special switchboard used for the telephone information bureau by means of which incoming telephone calls from the public for information relative to the arrival and departure of trains, connections at various points, ticket rates, etc., are received and answered with a minimum delay. It is of an entirely new type designed solely to meet the requirements of this class of service. At present it is composed of two sections, each section equipped with two operating positions, giving a total of four positions for present use and may be increased by another section of two positions when future growth warrants it. The temporary equipment will include 10 trunks to the central office, tie lines to the main private branch exchange switchboard and to the switchboard of the Pullman reservation office of the railroad company and extension stations located in other departments. The tie and extension line facilities, however, are limited, as it is not intended as a general custom to transfer public calls for information. An incoming call to the board operates a signal in each of the four positions and when taken up by one of the operators, puts a busy test on that particular line in all positions. The operation is entirely by means of keys, no plugs and cords being used. It has been found that with a switchboard of this type, team-work in handling information calls can be highly developed.

Interior of Main Pay Station.

The completeness and flexibility of the operating system is an illustration of the important part which the telephone today occupies in the dispatching of trains. Both the railroad and telephone officials gave great thought and care to the planning of this branch of the telephone service. A careful study was made, both from the railroad and telephone standpoints, in order to design suitable equipment for the tunnels, the switching towers, the train dispatchers, the yard master and other important officials in this department, and the final result was achieved only after many conferences had been held and the various uses to which the apparatus was to be put considered from every side.

Apparently every precaution human ingenuity could devise has been utilized to insure prompt and continuous service and in figuring



Pay Station in Ladies' Waiting Room.

all the voluminous detail of the present, provision has also been made for the future growth of the service. A very considerable allowance was made for this, for while the telegraph system of the railroad company has not been abolished, all train dispatching throughout this division will be by telephone.

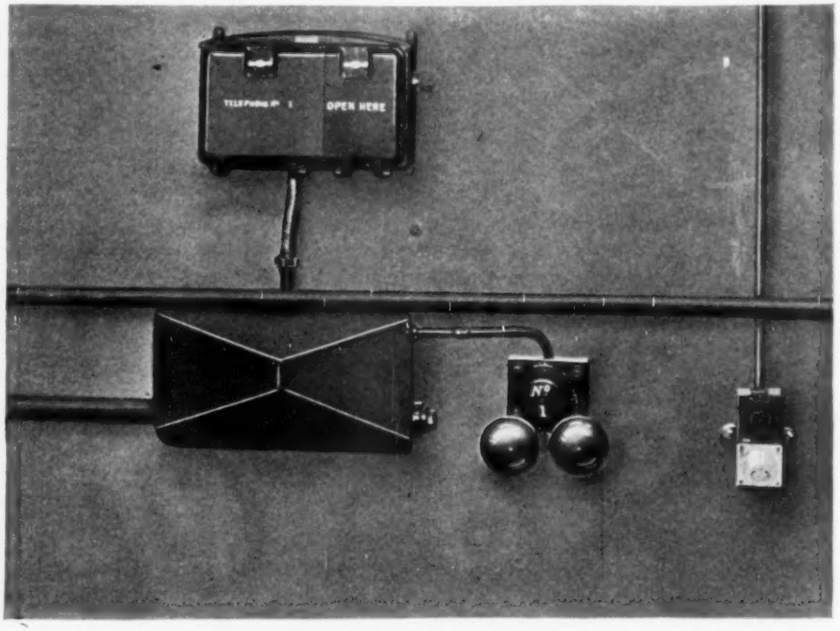
Comprising the system are 25 monitor switchboards of several different types, each having a capacity of from 10 to 30 lines. In locations where the telephone operating is the heaviest and where several railroad employes are required to handle traffic, common battery lamp monitor boards are installed. Where the traffic is not heavy, monitor boards of the magneto type are used. There are also special monitors which are exclusively for outgoing business or for the private use of some official; such types are not equipped with either drops or line signals of any kind.

All monitors are really terminal switchboards. They provide a convenient method of terminating at one point a number of lines which are used for switching and dispatching of trains from that location. In addition to the stations terminating on them, they are equipped with tie lines to other monitors and to the main private branch exchange switchboard. In each case they have been specially designed to permit of installation in the space most convenient in the various cabins, towers, offices, etc., an item which required careful study of each point and several changes in the plans before the types finally installed were evolved.

The station and tie line circuits which terminate in the monitors are of two classes, namely, circuits used in dispatching trains and circuits for auxiliary telephone apparatus. The train dispatcher's circuit is bridged in to the various switching and signal towers on the division and is supplemented by a selector system for signaling purposes. All of the apparatus used in connection with these circuits was designed to avoid the many perplexing delays incidental to handling a large volume of telephone traffic and at the same time afforded the maximum of speed and certainty.

For use in the tunnels under the North and East rivers which connect New York with New Jersey and Long Island, fifty-three telephones of a novel type were designed and installed at convenient points throughout the entire length of each of the several tubes. These sets operate on a magneto basis and are enclosed in cast-iron cases. Each set is provided with keys to permit its connection to either one of four circuits extending through the tubes, one of which is to the main private branch exchange switchboard, another to the train dispatcher's monitor board and a third to the switchboard at the power director's desk in the Long Island power house. The fourth key is not used at the present time, but was installed to provide for future growth.

Normally none of the tube instruments is connected to any of the above circuits, so that maximum transmission is obtained from any set when it is switched on to any of the four lines. For signaling



Special Tunnel Wall Set and Bell.

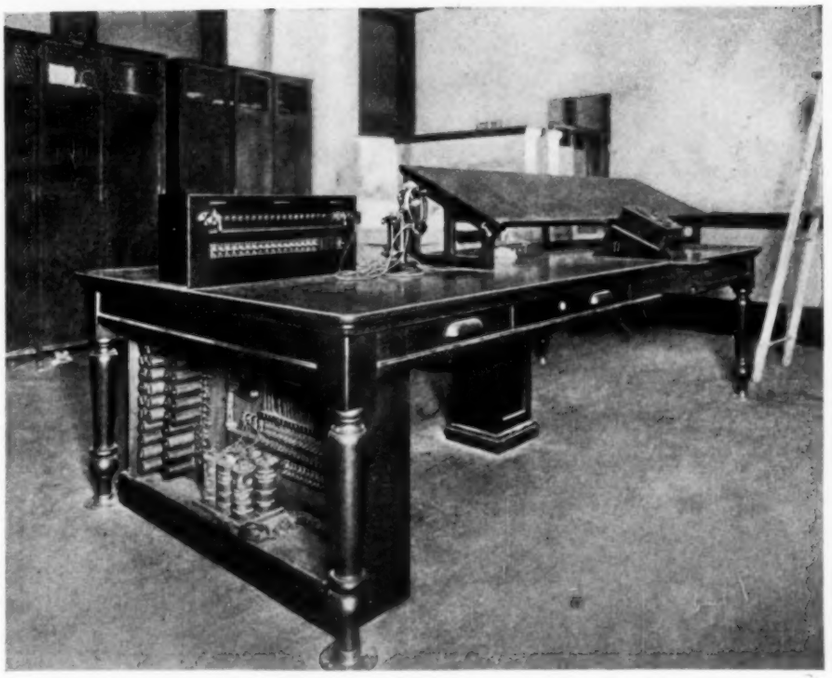
purposes a bell is provided for each set which is switched to the several lines with the instruments. In addition, a special signaling circuit is carried through each tube which operates from twelve to fifteen large gongs, located approximately 100 feet apart. By means of these gongs and a code ringing system workmen employed in the tubes can be signaled by any department. All of the tube instruments belong to the auxiliary system and in case of emergency provide prompt communication with the power house or train dispatcher, and by means of the connection through the main private branch exchange switchboard, officials of any department are placed in direct connection with every part of the tunnel system.

Upon taking up the question of public pay station facilities for the terminal, one of the first points considered was the necessity of selecting locations where the service would be most convenient for public use. The separation of arriving and departing traffic by means of the main and mezzanine floors of the grand concourse and its further subdivision owing to the many entrances and exits of the terminal provided a difficult problem for solution. It was found necessary to install two types of pay station service:

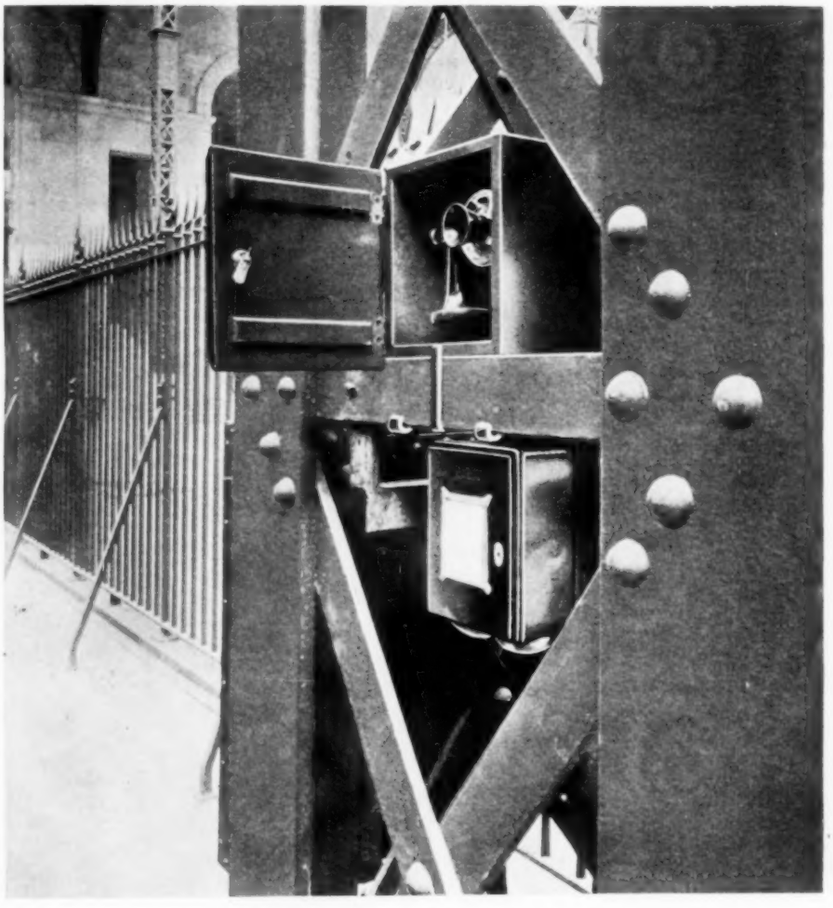
(1) The service operated by the telephone company, which is handled by means of switchboards and booths located in (a) the main waiting room, (b) ladies' waiting room, (c) exit concourse and (d) Long Island concourse.

(2) The pay station service in the restaurants, which is operated by the railroad company.

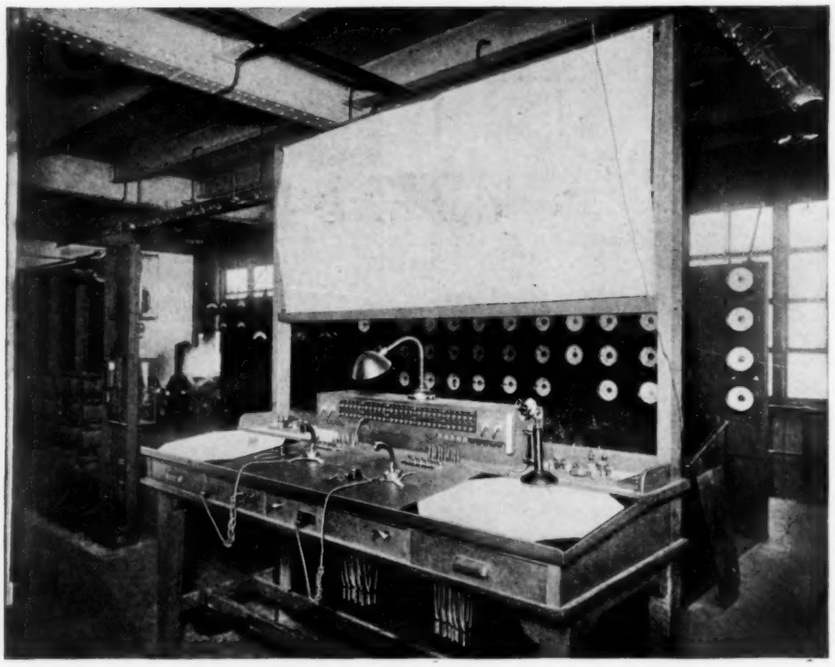
As the main waiting room is probably the largest and most beautiful in the world, the principal pay station installation, which is placed in its southeast corner, was carefully designed in order that in every way it might be worthy of its location. The apparatus consists of a three-position switchboard and thirty-six booths, all of which are located in a marble enclosure, together with desks for a cashier and a monitor or assignment clerk. The booths are of the receding door type and made of kalameined bronze to harmonize with the general scheme of the station. Telephone instruments of statuary bronze have been installed in each and the entire installation



Monitor Switchboard and Apparatus in Dispatcher's Office.



Gateman's Telephone at Head of Train Platform Stairs.



Power Director's Desk in Power House, Long Island City.

presents a most attractive and artistic appearance.

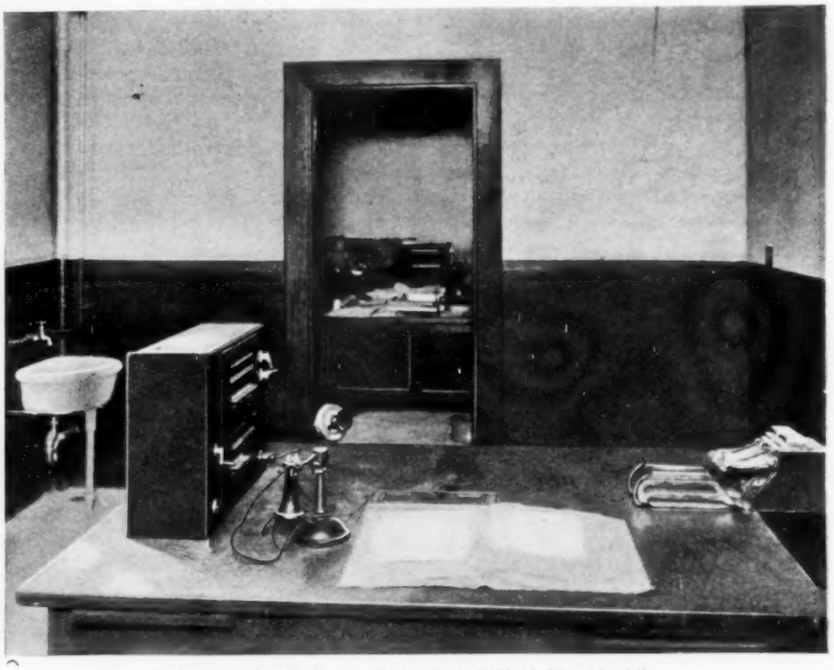
Not only the telephone apparatus required, but the arrangements to prevent congestion and avoid delay received the most careful consideration and as a result many small conveniences for the comfort of patrons have been devised.

After consulting a telephone directory, of which a large number are provided for public use, the patron enters the enclosure, gives the number to the monitor and is immediately assigned to a booth, which is reached by passing through a turnstile. The monitor enters the call and booth number on a toll check, passes it over to the switchboard attendant and pushes a button numbered to correspond with the booth. This operation lights the booth lamps inside and outside, a lamp on the monitor's desk and one on the cashier's desk, the latter lamps acting as busy signals so as to avoid the assignment of two persons to the same booth. All lamps remain lighted until the connection is taken down by the switchboard attendant. Upon receiving the toll check from the monitor, the switchboard attendant makes the connection, enters the time, passes the check to the cashier and when the patron is through talking takes down the connection. This final action puts out all of the lamps associated with it, the restoration of the cashier's lamp being a signal for her to be ready for collection. In leaving the enclosure the patron must pass the cashier, as the turnstile is so arranged that an exit cannot be made through it. The special lamps for lighting the booths and showing busy signals can be operated either from the monitor's or cashier's desk. In addition, during periods when but one or two attendants are required, they can be controlled from the switchboard independently of the two other points.

For the accommodation of patrons whose time is limited, ten booths are located outside of the turnstile and equipped with automatic pre-payment stations for immediate use.

To supplement the main system an auxiliary pay station installation consisting of a one-position switchboard and ten booths is located in the ladies' waiting room, the booths and instruments being uniform in appearance with those provided for the main waiting room. In the exit concourse is located a third installation consisting of a switchboard and ten oak booths also of the receding door type, while the Long Island concourse is taken care of by a fourth installation consisting of a switchboard and nine booths. With the exception of this fourth installation, all booths were provided by the railroad company at its own expense, the remaining apparatus having been installed by the telephone company.

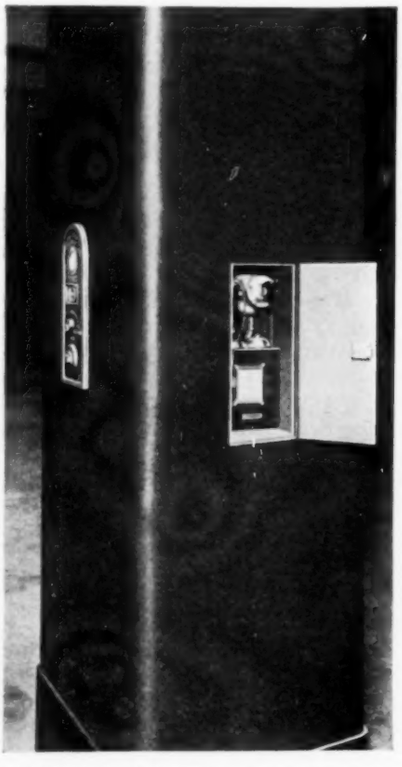
The pay station telephone facilities operated by the railroad company for use of its patrons in the restaurants have also been designed with careful thought for the public needs. In both the main dining-room and the lunch or grill room are located special walnut



Train Operating Switchboards in General Yard Master's Office.

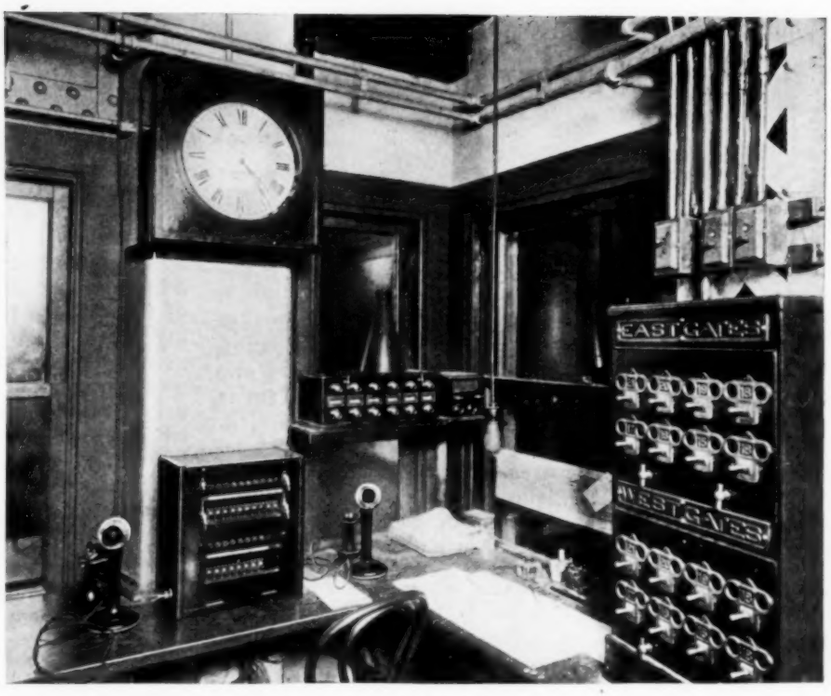
switchboards which harmonize with the other woodwork. From these switchboards are extended lines which terminate in a jack at each table. In order to make a telephone call, the guest seated at the table notifies the waiter who brings a portable telephone and connects it to the jack. The call is then made in the regular way and the charge for it is added to the restaurant check.

As an auxiliary to this restaurant pay station system and also operated by the railroad company is the service on limited trains when standing in the station. Standard desk sets are installed in the observation cars and are wired to outlets underneath each car. Similar outlets inserted in the station platforms at intervals of 300 feet permit the connection of the car instruments to the main private branch exchange switchboard by means of a long cable terminating in plugs at both ends. The railroad company's patrons are, therefore, provided with telephone facilities for receiving or sending messages throughout the Bell system at every point where a halt is made in the progress through the terminal and including even the last minute before the time set for the departure of the train. This in itself is a recognition of the important part the telephone plays in the life of the modern business man. He can keep within telephonic communication of his office until the train actually begins to move from the station platform and thus is able to add many minutes to the personal supervision of his affairs.



Telephones in Columns on Station Platform.

Throughout the entire terminal this attention to small details is noticeable and indicates the care which the railroad company has taken to study the convenience of its patrons at every point. It is quite certain, therefore, that when the great terminal is finally thrown open in its entirety to public use, all of its appointments, including the telephone system, will be found as nearly perfect as human foresight and ingenuity could devise.



Switching Cabin "C," with Dispatching Switchboard.

In the terminal building alone there has been installed for use in connection with the commercial service, 6,900 feet of lead-covered telephone cables. These cables contain 450 miles of copper wire and weigh 11 tons. The largest cable contains 1,212 wires and weighs over 7 pounds to the foot. It was necessary to make 43 branch splices in the largest of which 2,828 wires were connected. These branch cables terminate in 80 cable terminals containing nearly 5,000 binding posts.

To extend the lines from the cable terminals to the various instruments within the terminal building required 39,000 feet of twisted pair wire.

In addition to the cable plant above referred to, approximately 30 miles of lead-covered telephone cable containing 240 miles of copper wire has been installed in the terminal area and along the right-of-way to connect the operating equipment. This is all large gauge cable and weighs approximately 200 tons. In all cases this cable has been installed in ducts in the tunnels and along the right-of-way on the opposite side to the high tension power lines and special attention has been given to the proper protection of the lines and equipment.

Intercommunicating Telephone on Freight Train

The Vandalia Railroad recently conducted an interesting experiment with the telephone as an aid to freight-train operation. On a freight train of 123 cars, one and a half miles long, drawn by two engines, a telephone wire was strung along over the top of the cars, connecting telephone instruments in the caboose and engine cab. The movement of the train was directed by the conductor who, sitting in the caboose, telephoned his orders up to the enginemen.

A Study of Telegraphic Transmission

By Frank F. Fowle*

III. RELAY TESTS.

A SERIES of careful tests was carried out to determine the working properties and characteristics of standard, polar and neutral relays. The results of these tests will be described briefly.

Standard Type.—The standard type of relay for simplex lines is too familiar to need detailed description. The standard winding was for many years one of 150 ohms resistance, consisting of about 8,600 turns of No. 30 B. & S. gauge, single silk, copper wire, in two spools. The use of these relays on way or local circuits was found to increase the line resistance materially, and necessitated the use of a lower resistance line wire than would otherwise be required. Accordingly the spools were connected in multiple instead of in series, thereby reducing the resistance to 37.5 ohms and reducing the total ampere turns by half for the same line current.

There are three adjustments; these comprise means for regulating the length of the magnetic air gap between the pole pieces and the armature, the tension of the retractile spring on the armature, and the play or stroke of the armature. The limits of operating current are variable within wide limits by means of these adjustments used in combination.

A 150-ohm relay was placed in circuit with a source of constant E. M. F., a variable resistance and a milammeter. The resistance was then varied so as to determine the exact current at which the relay would just pull up and just release, with all combinations of adjustment. The mean of 19 tests showed that the average difference between the operating current and the releasing current was .003 ampere, with a maximum of .004 and a minimum of .002 ampere; the operating current varied from .011 ampere to 0.54 ampere.

A margin of .003 ampere between the operating and releasing currents is the extreme limit and cannot be realized in commercial service. The commercial margin is not less than .010 ampere. The normal operating current is about .050 ampere in practice. Using this value, and various values of releasing current, the corresponding values of ϕ and n from (44) and (46) are given below:

Operating Current.	Releasing Current.	Value of ϕ	Value on n.
.0500	.0400	.80	5.00
"	.0375	.75	4.00
"	.0350	.70	3.33
"	.0325	.65	2.96
"	.0300	.60	2.50
"	.0250	.50	2.00

By increasing the operating current above .050 ampere the values of ϕ and n can be increased slightly, and this will generally improve the working on leaky circuits. However, this cannot be done to a great extent without changing most of the battery or power-plant installations. A value of .060 ampere can often be obtained, however. It is correspondingly true that lower operating currents than .050 are a disadvantage, because the values of ϕ and n are then less, and the line cost is increased.

Similar tests of a standard type 35-ohm relay gave a limit of margin from .006 to .008 ampere. On account of the reduced turns in the winding the normal operating current in commercial service should be somewhat greater than .050 ampere, in order to get the same values of n as are obtainable with 150-ohm relays. The use of enamel insulation instead of silk secures greater efficiency in the use of winding space and a greater number of turns for the same total resistance. Relays can now be had with windings insulated with this material and they give, of course, the maximum number of turns with a given resistance, or a minimum resistance with a given number of turns, on a core of given diameter and length.

Polar Type.—The tests of polar relays were made to determine the limiting and commercial values of current which would give positive reversals of the armature when working through one of the half-windings. Polar relays are built in two general types. The oldest of these is the Bunnell pattern. A half-winding of one of these relays was placed in circuit with a source of constant E. M. F., a variable resistance and a milliammeter, with means for reversing the current. Similar tests were made of two relays of the Stroh type, which is now used extensively. The results are given below:

Type of Relay—	Total Resistance.	Minimum Reversing Current.	Commercial Reversing Current.
Bunnell	750.	.002	.004
Stroh, No. 1	600.	.002	.004
Stroh, No. 2	800.	.002	.004

The polar relay is seen therefore to be very sensitive, much more so than the standard types. Polar types are designed with three adjustments, as follows: The length of the magnetic air gap between pole pieces, the bias of the armature toward either pole and the length of armature stroke or play. When no disturbing foreign currents are present, the armature need have no bias, but when earth currents are to be overcome the armature must be biased so as to balance against them. A minimum armature play is essential to secure the maximum sensitiveness because the armature at either end of its stroke is then nearer the neutral field or exact neutral position.

Neutral Type.—Neutral relays are built in various types; in general characteristics they differ but slightly from standard relays and are provided with the same adjustments. Three types were tested to determine the minimum commercial operating current in one of the half-windings, using the general method of testing standard relays before described.

The result of eleven tests of a 300-ohm relay of the Foote-Pierson type showed an average difference or margin between operating and releasing currents of .0074 ampere, with a maximum of .010 and a minimum of .004 ampere. This relay required a commercial operating current through one half-winding of about .050

*A report on the use of copper, iron, and copper-clad steel wires in telegraph service, made to Frank R. Chambers, Jr., vice-president of the Duplex Metals Company, August 1, 1910. Continued from the December number of TELEPHONE ENGINEER.

ampere, at least, and a value of ϕ not exceeding 0.6 approximately.

Tests of a 300-ohm relay similar to the standard type, but with shorter magnets, showed that the margin was approximately .005 ampere. It would operate commercially on a current of .040 ampere. This relay was wound with enamelled wire, giving 2,800 turns in each half-winding.

The Frier neutral relay is a self-polarizing type, different from the two just mentioned. The result of 10 tests on an 800-ohm Frier relay showed an average margin of .0066 ampere, with a maximum of .008 and a minimum of .005 ampere, with one half-winding. It will operate commercially on a current of .030 ampere.

None of these relays will operate commercially on values of ϕ exceeding 0.5 to 0.6 approximately. The Frier relay shows itself to be the most sensitive of those tested, due very largely to the greater number of turns in its winding.

The summary of results is next given:

Type of Relay—	Total Resistance.	Commercial Operating Current.
Foote-Pierson	300.	.059
Like Standard	300.	.040
Frier	800.	.030

In all these tests the element of judgment enters in determining the commercial operating current. The values given are not the lowest possible, but are the lowest values at which the relay will respond quickly and positively, with firm closure of the local contacts. Naturally the operating values given cannot be highly precise, and a variation of five per cent to ten per cent represents the probable error.

(To be continued.)

Intercommunicating on the Lake Shore

By Clifford Weldon

AMONG recent developments in the railway telephone field the Lake Shore's installation of the new Gill intercommunicating selective calling system is of special interest.

The system enables each station to call any other station on the circuit selectively, retaining all of the operating features of the standard train dispatching equipment where the dispatcher does the calling.

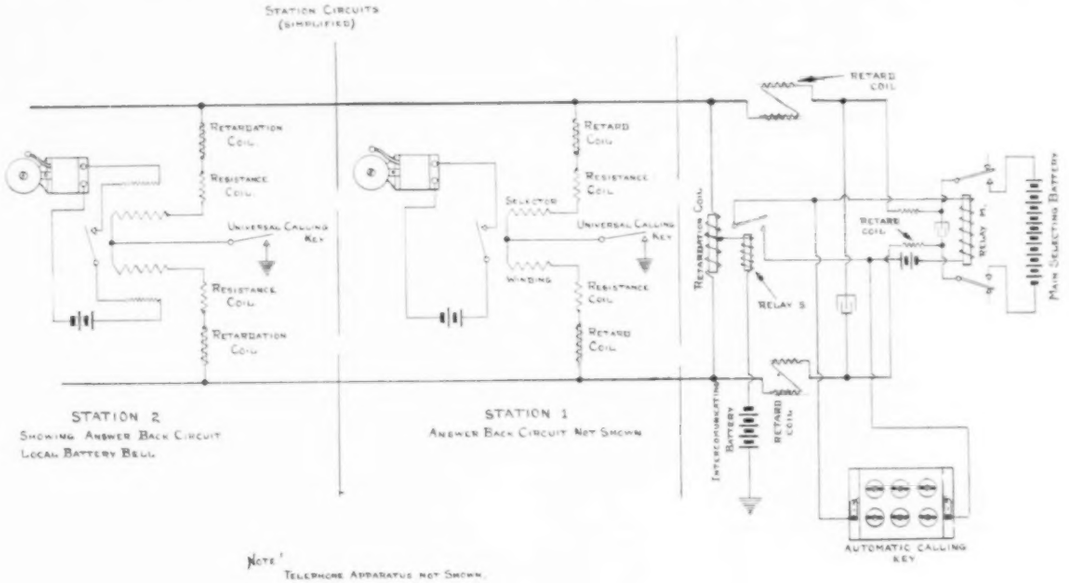


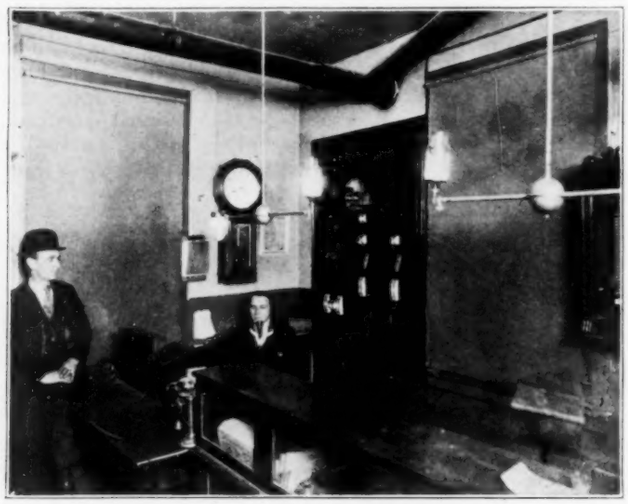
Fig. 1.—Diagram of Gill Intercommunicating Selective Calling System.

The installation has been made on a branch of the Lake Shore & Michigan Southern known as the Dunkirk, Allegheny Valley & Pittsburg Railway, which operates between Dunkirk, N. Y., and Tittusburg, Pa., a distance of ninety miles. The intercommunicating service is provided at twenty-two offices along the circuit, including the dispatcher's or master station, at Dunkirk, N. Y. The traffic on the branch being comparatively light, one circuit is used for both train dispatching and message service. When the dispatcher, whose duties are not confined to the operation of this branch, is not using the circuit the offices along the line interchange messages. The intercommunicating equipment enables them to make the interchange without bothering the dispatcher to do their calling for them.

The use of iron wire on the circuit is another feature which will be of interest to railway telegraph superintendents whose telephone development has progressed to a point where telephone service for their branch lines is a serious consideration. Two No. 8

iron wires, which have been in telegraph service for many years, have been transposed and utilized for this circuit. The resistance of the joints in the old iron line has been eliminated by bridging the joints with an iron wire soldered on each side of the old joints.

The loop resistance of the circuit is 3,950 ohms, or 44 ohms per metallic mile. The telephone trans-



Dispatcher's Office at Dunkirk.

mission is entirely satisfactory due to the extremely highly efficient telephone equipment which has been used.

The equipment is what is known as the "Kellogg Booster" and in the opinion of those in charge of the installation, the circuit could not have been made a success telephonically without the use of the "booster" equipment.

The Gill intercommunicating selective equipment

View of the Dunkirk Equipment.

is very similar to the standard Gill apparatus. A universal automatic calling key, shown in Fig. 2, is installed at each station in addition to the regular equipment. Reference to the diagram (Fig. 1) shows the key connected to ground from the center of the selector magnets with the contact of the key normally open. A grounded signaling battery shown in Fig. 2 at the master office, is connected through the relay *S* and retardation coil to the line. It will readily be seen that the operation of the universal calling key at each office momentarily grounds the line, causing the relay *S* to operate, which sends the desired number of main battery impulses to line operating all of the selectors on the circuit as in standard train dispatching.

The relay *S* operates on 45 milliamperes, and a leak to line of 10 milliamperes through the relay does not interfere with the satisfactory operation of the intercommunicating equipment.

An automatic calling key cabinet equipped with an individual calling key for each station is located at the dispatcher's office to enable him to call any station by simply turning the key corresponding with the station desired.

The selectors in use on the circuit are the two-figure confirmation Gill type. Owing to the low number of impulses required to operate any of the two-figure selectors a call is completed in three and one-half seconds and this is accomplished without sending the impulses at high speed. As in the standard four-figure Gill equipment the full contact is never closed except when the station is called.

The operation of the universal calling keys at each

Fig. 2.—Automatic Intercommunicating Switch.

station is simplified by the use of the two-figure selectors, only two partial rotations of the dial being required to make any combination.

A switch located at the Dunkirk relay office is arranged to cut off the intercommunicating battery in case of emergency or when either wire of the telephone circuit becomes grounded. When the intercommunicating battery is disconnected the dispatcher or relay operator can call any of the stations on the circuit but the stations can not call one another.

Standard Gill selector installations of either the local or the main line bell battery type can be equipped for intercommunicating service by the addition of the universal automatic calling keys at the way stations and a slight change at the master office. Existing telegraph facilities such as a bank of gravity batteries with a little excess capacity or dynamo current can be utilized for the grounded intercommunicating signaling battery. The change to intercommunicating service does not decrease the efficiency of existing circuits or increase the noise in the telephone receivers due to the signaling impulses.

Telephones on Electric Railways

ELECTRIC railways, especially those paralleling steam roads and competing with them for through traffic, find fast train schedules an important factor in securing their share of the business, and any slight decrease in the running time between terminal points usually results in a corresponding increase in business. On all railways, especially those on which the limit of safety and capacity of the equipment has been reached, a good system of dispatching and an efficient, reliable system of communication between all parts of the system has resulted in not only better running time but a better maintenance of schedules.

An excellent example of how an efficient system of communication will quicken train service and aid generally in handling the business of the road is afforded by the New Hampshire Electric Railways on its lines operating around Haverhill, Lawrence, Lowell, Nashua, Hampton Beach, Salisbury Beach and intermediate points. This railway system uses telephone in connection with its train dispatching, to connect the repair shop with the various houses, to connect the power house with the rotary stations and for general purposes, such as reporting defects in cars, track and overhead lines, and ordering supplies for the various car houses.

The telephone system is divided into two general divisions corresponding to the divisions of the road, namely, the Eastern and Western divisions. In the Eastern division, which is subdivided into the Eastern New Hampshire and Eastern Massachusetts divisions, the main swtichboard is located at Amesbury, with pony switchboards at Plaistow and the Amesbury and Salisbury car houses. This division covers about sixty miles of road and is equipped with twenty-eight telephones. The Western division is made up of five subdivisions—Canobie Lake, Haverhill-Salem, Salem-Pelham,with branches to Nashua and Lowell, Salem-Lawrence, and Haverhill Junction.

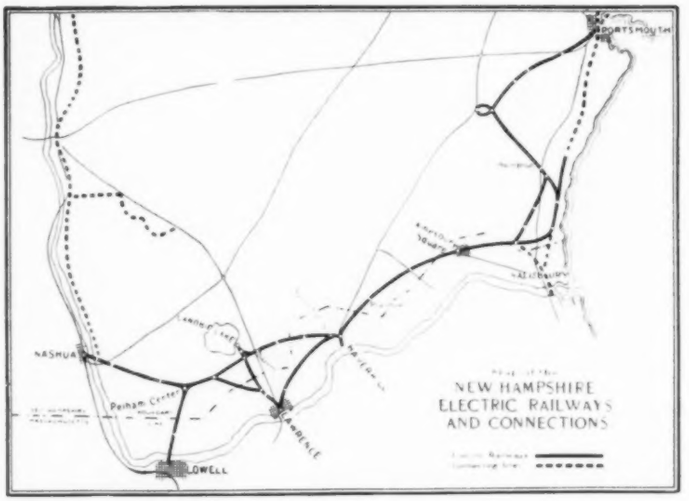


Fig. 1.

NEW HAMPSHIRE ELECTRIC RAILWAYS
WESTERN DIVISION

Despatching Order No._____ Date_____ 190___

_____

_____

_____

_____

_____

_____ Conductor _____ Motorman

Correct at_____ M. _____ Despatcher

Fig. 2.—Form of Form of Train Sheet Used.

The main switchboard is located at the Salem car house, with pony boards at the Pelham car house and at the general offices of the company at Haverhill. This division of the road is 47 miles in length and is equipped with thirty telephone stations, in addition to those in use at Canobie Lake Park.

There are also two other telephone circuits, one connecting the car house at Salem with the machine shop and the houses of the master mechanic and superintendent, the other a circuit paralleling the high tension transmission lines, which supplies the power for the road. The power for operating the trains is generated at Portsmouth, New Hampshire, and transmitted at 13,200 volts, alternating current, to sub-stations at Dover, Stratham, Plaistow, Amesbury, Salem, Methuen, Pelham and Hampton, where it is converted to 600 volts, direct current. The telephone line paralleling the transmission line is 55 miles in length, and is equipped with telephones at each rotary station. The high tension patrolman always carries a portable telephone and by cutting into the line, can connect with any point desired.

The dispatchers at Salem and Amesbury can keep in constant touch with the power house at Portsmouth and each of the rotary stations. In case of a breakdown, on the high tension circuit, if a rotary station gets damaged during heavy storms, the heads of the departments can be notified at once and the necessary steps taken to clear the trouble immediately.

Although the Canobie Lake division is the shortest, being but 1.5 miles in length, it is one of the busiest divisions in the system during the summer because of the amusement park at Canobie lake.

Canobie Lake park comprises approximately 50 acres of land and forest, having its frontage on Canobie lake. It is easily reached by trolley from all points in New England. This park is located in the town of Salem, New Hampshire, 45 minutes ride from the cities of Haverhill, Lowell and Nashua, and 30 minutes ride from the city of Lawrence. The management caters especially to societies, churches and organizations, to whom special inducements are offered. It is estimated that approximately 500,000 people were in attendance at this park during the season of 1910.

The dispatcher for the Western division is located at the Salem car house (see Fig. 1) and from this point he controls all the cars on this division. The telephone equipment here consists of a Western Electric switchboard of thirty-line capacity, with trunk lines running to pony switchboards located at Haverhill and the Pelham car houses. At each siding and at other important points along the line there is a convenient telephone booth in which is installed a telephone set, a lightning arrester and an Egry triplicate copying machine. This machine makes three copies of each order, one of which goes to the conductor, another to the motorman, and the third winds up within the machine, which is locked and is used to verify any reports should occasion arise as to just what the order was. The conductor after receiving his orders from the dispatcher writes them out and then repeats them back to the dispatcher, who gives his O. K. and puts down the time on his train sheet. Fig. 2 shows one of the forms used. The dispatcher enters his orders on a regular train sheet similar to that used on steam roads, and he is held responsible for the service.

This system of dispatching is used on both Eastern and Western divisions, when extra cars are run over the various lines. When the regular schedules are in force, all cars pass at designated points and dispatching orders are not given except for the control of line or construction crews, during delays or when accidents occur. The switchboards and telephone apparatus of the entire system were furnished by the Western Electric Company.

Santa Fe Telephones

The Santa Fe railway has completed its telephone dispatching system between Las Vegas and Raton. The system was used for some time in order to give it a thorough test. Soon it will replace the telegraph in the handling of trains.

The line between Las Vegas and Albuquerque is being completed. The wires were strung several weeks ago. Within a few months Albuquerque and Gallup will be connected by the telephone system. This will place telephone dispatching in daily use on every mile of the main line from Chicago to Los Angeles. The coast lines were equipped with telephones some time ago, as were the other divisions from Chicago to La Junta.

To overcome induction the heavy copper lines are transposed every one-fourth mile. The dispatchers, when equipped for work, wear on their heads the same kind of instruments as do central girls in a telephone exchange.

The system of sending train orders is not changed, the orders being sent to the agents at the various stations, who deliver them to the train crews and notify the dispatcher of the time of arrival and departure of trains. In some instances the engineer and conductor will go to the phone and receive their orders directly from the dispatcher. The system has been found to work perfectly in every detail. The telegraph will be used in transacting general railroad business.

Dispatching Telephones Prove Usefulness

The value of the telephone method of dispatching trains, which has superseded the old familiar telegraph on many of the largest railroads of the country, has been demonstrated by the behavior of this system on the Pere Marquette during recent sleet storms. The telegraph was put out of commission, but the telephone circuit worked continuously and received many words of praise from the railroad people. Telephones and selectors furnished by the Western Electric Company have been placed in service along 136 miles of this road, between Saginaw, Mich., and Toledo, Ohio.

The telephones have been installed at thirty waystations and four sidings. The service on this division will be watched with interest, as the traffic on the Toledo division is usually heavy. Several times in the past the railway has found it necessary to cut the telegraph train wire into two sections in order to handle the traffic, but it is believed that the telephone equipment will enable the work to be handled entirely with one circuit.

The Michigan Central has recently installed train dispatching telephone circuits between Jackson, Mich., and Niles, Ohio, 105 miles, with 34 telephone stations; between Jackson and Bay City, Mich., 115 miles, with 23 stations, and Jackson and Grand Rapids, Mich., 94 miles, with 21 stations. Equipment has been ordered for a telephone line between Windsor and St. Thomas, Ontario, Canada, 111 miles, with 20 stations. Plans have been made for the installation of a number of other circuits during the coming year.

E. & T. H. Installs Telephones

The Frisco System, on its Evansville & Terre Haute line, will in a short time install telephones in place of the old Morse telegraphic dispatching service. This is in line with operating changes on many of the greater railroads of the country.

The Evansville & Terre Haute road's telephone equipment—instruments, material and labor cost of installation, etc., will cost the Frisco an approximate $10,000. A copper metallic circuit, on which the selector system will be operated, is built from Terre Haute to Evansville and telephone instruments are being put in place. The selector system is esentially this: The talking point can reach any operator on the line without interfering with any other offices and another advantage, overcoming disorders of the calling bells, should they become out of order, dropping of a red ball in view of the operator when he is wanted, is to be a feature of the system.

The old Morse system will continue in use as auxiliary to the telephone wires for emergencies and message work for the road. Since the inauguration of the eight-hour law governing the employment of railroad telegraph operators, the overdemand has swallowed the supply. The railroads, unable to meet the demand of one-third more operators than they were employing before, are turning to the telephone. The pay has increased materially for telegraph labor and the railways and commercial telegraph schools are schooling scores of young men for this branch of railway service.

The Union Railway Company of Indianapolis, which operates Belt tracks encircling the city, is about to install a system of telephones wherewith its trains will be dispatched. The officials have instituted this new policy, believing that the trains can be handled more speedily than by the former system.

Rates and the Public

By C. L. Meyers*

AS the happiness of man is influenced to a more or less degree by the cost of living, there is a never-diminishing interest in that subject. The cost of living is affected by a multiplicity of different elements, about each or most of which the average man is concerned, according as his personal interest is involved.

The justification of the price of a given thing is demonstrable only in proportion as the benefits derived by the purchaser and his understanding of the cost of production and the risks incident thereto can be shown. The average purchaser is more concerned about values, benefits and advantages obtained for the price paid than about the details of the cost of production, though the purchaser is, naturally, interested in knowing that the price paid bears a proper relation to the cost of production. In other words, the purchaser desires to know that extortion is not an element of the transaction.

It is less difficult to justify the price of a tangible commodity, which, on account of its solid or bulk form, may be seen, than an intangible commodity in the nature of a service rendered or performed and which is comprehensible only from thought—that is to say, in the imagination.

The variety of that great body which we term the public is limited only by the number of people composing it; it is made up of people from every walk of life, each interested in, studying and trying successfully to understand the particular avocation or business in which he or she may have engaged. Hence, it is idle to expect people in one line of endeavor or business to be well informed about all of the others.

It seems to be a fundamental of human nature to expect the lowest possible prices for all purchasable things. This is as it should be, provided always that such expectancy is balanced by a proper sense of proportion and embraces a right understanding of the cost of production, and more particularly a just consideration of value received for the price paid.

Left to his own conjectures about a successful and prosperous business, and especially one of a highly technical nature, conducted on a large scale, and one that he has made no careful study of, the average man is prone, from the suspicion born of ignorance on the subject, to think that any price put upon the product of that business is too high. The greater the magnitude of the business the deeper does this impression take root, for the success of some excites the envy and cupidity of others, and this has been true for all time in the memory of man. This latter class seems always ready and anxious to becloud any question or issue in or about which there is a general interest.

These premises considered, it is at once obvious that it behooves every man to so thoroughly understand his business and so place and keep it before his patrons as to give them a proper conception of the relation that its usefulness and value bear to the price of its product.

Perhaps nothing is more calculated to excite suspicion about and distrust of a business than to find the people engaged in it unprepared and unable to defend it in every general particular. Conversely, there is probably nothing more calculated to elevate and inspire confidence in and respect for a business than to find the people conducting it prepared to meet with undisguised readiness and candor any unjust criticism or suspicion of the fairness and reasonableness of the price charged or of the policies followed in such a business.

What has been said is true of every business, but it bears with especial importance on our own, since our business is affected with a public interest, and the public has come to expect us to show that we are conducting our business on a high plane of honesty, practical economy and efficiency.

The time alloted to me admits of my touching only upon a few of the things that our employes, and especially our managers and agents, should acquaint themselves, and, in turn, our patrons, with.

POLICY.

We realize that our stock in trade and biggest asset is the good will, esteem and confidence of our patrons; that it always has been, and necessarily must continue to be, our earnest desire to furnish service at the lowest price consistent with reliability, efficiency, a proper maintenance of the property and a fair return to the stockholders, with a reasonable amount left over to care for contingencies, such as tornadoes, sleet and hail storms, fires, etc. As it is to our interest to please our patrons, there can be no possible incentive to do anything to displease, any more than any man in business would deliberately do a thing to displease and drive away his patrons. I can offer no stronger confirmation of this than to refer to a rule which has been imbedded in our policy since the organization of the company. To keep this rule before our patrons and emphasize our sincerity with regard thereto, we print it in all of our directories, as follows: "Uniform courtesy and politeness is an imperative rule of this company, and any infraction thereof will receive prompt attention if reported to the general offices."

VALUE BY COMPARISON.

Perhaps nothing affords a better scale for weighing values than comparison. A man may not be able to judge the value of a thing *per se*, but by contrasting it with other things a different result is obtained. There is nothing within my knowledge that offers more, or even as much, value for the rate charged than telephone service. It will not suffer by comparison with the telegraph, the mails, the railroad, messenger service, or any other means of communication or transportation.

The telephone is one of the greatest benefactions the world has ever known, and considering its usefulness, the price charged for the service is insignificant. While the price of practically everything else has increased in the last few years, the price of telephone service has steadily decreased—not only in the

*Paper read at the convention of managers and agents of the Cumberland Telephone and Telegraph Company.

rental per station, but in that true unit of value and test of usefulness, the call. The price per call, or connection, both local and long distance, has decreased. The man who became a subscriber in Memphis ten years ago, when there were less than 3,000 subscribers, pays no more, and in many cases, and certainly on the average, now pays actually less, for service with nearly 10,000 subscribers. In other words, the value of his service—the possibilities of use—has increased over two hundred fold, while the rate has literally decreased. So, the rate, considering the possibility of use, is over two hundred per cent less today than it was ten years ago. What is true of Memphis is true to a more or less degree in every exchange operated by the company, and this rate decrease is a never-ending process, for practically all exchanges are growing and with their growth the value of the service expands while the rate remains stationary until a given condition, necessitating an increase, is reached. We all should know of the conditions that make it necessary to increase rates under certain conditions. But even when these increases are made the rate rises only slightly as compared to the increased possibility of use—about 11 per cent increase in the rate to 100 per cent in scope of service.

RELATION OF RATES TO SALARIES.

The relation of rates to the public has a very considerable influence on each community in which we do business, not only from the fact that each community is interested in having us maintain a reliable and efficient service, but also because employes form a not unimportant part of the community. Each employe should constantly bear in mind that just in proportion as the company is able to collect proper rates for its service it is able to compensate its employes. The ability of its employes to get a good, comfortable living out of the business is necessarily limited and measured entirely by the company's ability to market its products at a price that will enable it properly to take care of its employes. So that to the extent that its employes prosper, the community in which they live thrives.

We should let the public understand that if we do not receive living rates the purchasing power of the company and its employes is curtailed and the communities which it serves suffer in like degree. The public demands an efficient service and economical administration. To provide these we must be able to enlist the services of skilled, competent and high-class men. Such men are not to be had for a mere pittance. They will not engage in a business which does not offer them as many opportunities for personal and pecuniary advancement as are to be found in other lines of endeavor. Niggardliness in this respect would compel the company to employ an inferior grade of men, would reduce the standard of service, and result in injury to our patrons and the public generally. Let no man be timid about keeping these things constantly before the public, for if he does not he is standing in his own light.

EXPANSION.

In most businesses the capital account may be closed as soon as the enterprise is launched. Our business is unique in that there is a ceaseless change in the personnel of our patrons and a constantly increasing demand for our service. Old subscribers move away or change their locations. New subscribers are added. The average life of a subscriber in the telephone business is only five years. To make these changes and furnish new patrons with service necessitates a large working capital and involves considerable new investment in the plant, for each new patron must have his separate pair of wires and switchboard number, his additional instrument and all of the appurtenances incident and necessary thereto, including cable pairs, cross-arm-space, sometimes new poles, and a multiplicity of other apparatus. If a telephone system could not grow it would lose its value by a gradual dwindling off of patrons. Nearly all communities are growing. If the newcomers to these places should be unable to obtain telephone facilities, imagine what great inconvenience and commercial loss would result! Such a condition would be intolerable, as almost everyone knows. To meet the demand of new patrons we must add to our capital account from time to time. The question of how to obtain this new money has not been an easy one to solve, and it becomes more perplexing and difficult with every effort of the public to be unfair in the matter of rates. Hostility of legislatures, municipal bodies, corporation baiters, demagogic politicians, unfriendly patrons, all are in the nature of obstacles, for no investor, be he big or little, will risk his money in a concern whose integrity is threatened by general hostility. Sporadic hostility, inspired by designing persons with selfish motives, is not unexpected, but there is nothing about our business, if we conduct it properly, that should excite a general hostility. We should let our patrons especially and the public generally understand that their interests, rather more than our own, are injured by antagonism to equitable rates and fair policies. By equitable rates I do not mean one that is so trimmed and cut and weighed in the balance as to enable us just to see above water, so to speak. I mean a rate that takes into consideration the hazard of our business, the proper maintenance of the plant and service, and the comfortable and respectable sustenance of the company's employes, with a margin left over for the rainy day. It is just as dangerous for a corporation not to provide for contingencies as for the individual to be improvident. You know how much respect we have for the man who lives up to his income. "Wilful extravagance means woeful want," and it would be a flagrant and unpardonable extravagance not to provide for the rainy day. If we did so, investors would lose confidence in the company, its credit would be impaired and it would be unable to raise the money with which to make the extensions of plant that are so essential to its own and the public welfare. Nor could the company attract investors to its securities if its rates did not enable it to pay as large a return as might be found in other undertakings carrying with them an element of risk kindred to that in our business.

Reverting to the matter of each man having a proper knowledge of his business: You should know the details as well as the general features. Be able to show a patron why it is necessary to charge a higher rate to those living outside the exchange radius, why the unit of cost is not the instrument on the wall, why the rate, *per se*, is not reduced as the number of patrons increase, how the value of the service increases with added patrons, why it is necessary to charge more in the larger exchanges, why the public has a greater interest in having a reliable, efficient service from a

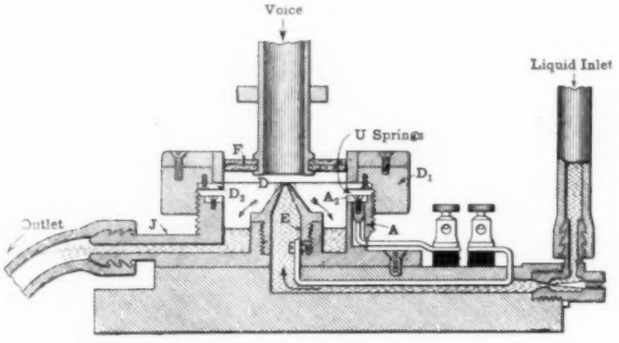
trustworthy company than in having low rates and poor service from a concern that may be unable to meet an emergency.

And try to keep this before you: Know your business. A man who cannot justify his own activities in a business is in a most embarrassing position, and is certain to fail. He cannot expect to enjoy the respect, confidence and good opinion of the people in his community, and from first to last, and throughout, such a man may expect to meet with humiliating defeat. There is no reason why every man here should not be in a position to give an intelligent reason for and explanation of every rate in his exchange and of every policy and rule of the company. If you are in doubt, your superintendent will help you, and every man connected with the company who happens to be specializing a certain branch of the business and on that account may perhaps know what you wish to learn, will help you. All you have to do is to call, but don't let it be said of you that when a patron complained of a rate or a rule, the best you could do was to say, "Those things are arranged in Nashville, and I don't know just why they are that way." How long would a merchant keep a clerk who offered such an explanation? There is no rate or rule of ours that you cannot defend with reason, fairness, and even with pride. There is nothing to be ashamed of, but when you offer the weak, lame excuse of ignorance, you are either discounting and lowering your own standing in the community, or you are injuring the company by giving it a reputation it doesn't deserve, and in either case you are the wrong man for your job.

A Liquid Microphone

By F. J. Chambers*

AFTER prolonged investigation of the elemental factors which go to make up a Hertzian wave telephone equipment, it has come to be the opinion of the writer that the field of utility open to this class of communication is divided, by technical and commercial consideration, into two distinct parts. One of these depends on the short distance robust form of installation, cheap to manufacture, and which can unquestionably be put into the hands of the unskilled person, and the other requires the use of more complicated forms of apparatus, for long distances, which need the attention of trained operators. Even the most sanguine inventor will admit that neither of these has as yet been evolved in really practical form, though most has been done in regard to short-distance work. Yet in this case the customary combination of the carbon microphone, which controls small energies, with large initial generating power, strikes the technical mind as being scientifically incongruous, and seems to suggest that the true solution of the problem lies in combining the carbon transmitter with what has yet to be discovered, namely, a generator of electric oscillations with the required properties, which deals with energies of the same order as the microphone; or, still further, a "generator microphone." Although the writer is at present working in the latter direction also, it is the immediate object of this article to describe one form of variable resistance instrument which, it is hoped, will eventually supply a need in the second or long-distance form of station.



Chamber's Liquid Microphone.

In order that the wireless telephone for skilled operation may become of commercial value, it must be able to compete on reasonably favorable terms with the small power telegraph. It should have, let us say, a working range of a hundred miles at least. To effect this, if the controlling factor be a variable resistance instrument, it must be capable of dealing with an energy of the order of some hundreds of watts, and the range of control actuated by the voice must be wide. For wireless work it must be constant in its action, it must impose a load on the circuit which varies only by reason of the influence of the sound waves. In dealing with large currents it is the practice of many workers to use a solid form of variable resistance instrument, such as a carbon microphone or combination of microphones, in which the destructive heating, due to the absorbed energy, is combated by some form of artificial cooling, water or a hydrocarbon being employed. The resistance of the microphonic contact, however, is well known to be of indifferent constancy, and it is principally for this reason that microphones are so frequently "burnt out," so that, in the present instrument, the writer has preferred to pass the oscillatory current through an electrolytic path, which has a constricted portion of high resistance, one or more dimensions of which is varied by the excursions of a vibrator actuated by the voice. In order to absorb the considerable energy necessary, this variable electrolytic resistance is kept in a state of continuous flow, so that a cold supply is constantly replacing the liquid heated by the current. It is clear that a change in the dimensions of the constricted portion of the liquid will, in general, produce a change of the velocity of the liquid along the constricted part of its path, and consequently, even when the resistance of portion is altered positively by change of volume, it will also be further altered indirectly by the resulting change in the velocity of the liquid. These two changes must be arranged to act in unison, for in some cases the temperature coefficient of an electrolyte is as high as two per cent for one degree C. variation. Experimental work, extending over some twelve months, has determined that the most

*The Electrician, London.

practical form of instrument is that embodied in the figure. Many varieties of valve were tried, including several forms of vibrator appended to a diaphragm, but tests showed that it is most advantageous to employ the diaphragm itself as one boundary of the constricted portion.

The figure shows, in cross section, a complete instrument. A metallic diaphragm, D, is mounted upon a ring ebonite holder, D_1 in contact with a metal ring, D_2, secured to the latter. The under side of the holder is turned out, and a female thread chased upon the inner side. The ring is screwed upon A, the body of the apparatus, by means of this thread. Inverted U-springs serve the double purpose of taking up the backlash in this thread and making electrical connection between the diaphragm and a second ring, A_2, secured to the ebonite body; from this ring a lead is taken out through the wall of the body to one terminal. The diaphragm thus forms one electrode, and the other is shown at E, a tubular piece of metal with an upper nipple. The liquid supply is led through a fine adjustment valve, I, to the centre of the lower electrode, passing through the latter and the constricted portion between the diaphragm and its lip, and is collected in an annular reservoir formed in the body of the vessel, A, from which it passes by an outlet pipe, J. The lower electrode is connected by a lead passing out through the body of the vessel to another terminal. The flow of liquid is controlled by the fine adjustment valve, I, and the distance between the diaphragm and the lower electrode is adjusted by revolving the diaphragm holder. A speaking tube concentrates the sound waves upon the diaphragm, and F is a disc of felt which confines these, while allowing the holder to be revolved.

The head of liquid was fixed by experiment at from three feet to four feet, and a shallow supply tank, of large capacity, is arranged accordingly. As the instrument is primarily intended to be used with high-frequency currents it is unnecessary to make provision for electrolytic decomposition, and it is obvious that the liquids must not be raised to boiling point. In practice, the velocity of flow is adjusted so that the liquid is withdrawn from the influence of the normal current at a temperature not exceeding 80 degrees C., thus a safety margin of 20 degrees C. is left for variations. When the microphone is installed in a wireless station, the energy in the antenna is approximately measured, and the speed of flow arranged to correspond with that portion which is to be allotted to the microphone. The resistance of the instrument is then adjusted by trial and varying the conductivity of the electrolyte, to suit the other electrical characteristics of the circuit. These two are permanent, leaving only the diaphragm adjustment which has been found easy of operation by the aid of a permanently installed hot wire instrument. The constancy of these is remarkable, an experimental instrument has repeatedly been left over night with the liquid turned off, and found to be in perfect adjustment next morning directly the flow was started. It is possible to use very thin diaphragms of large diameter, for the liquid is a most efficient damping agency for the tendency of the diaphragm to swing in its own period. The speech reproduction is exceedingly good, and resembles a voice speaking in a space surrounded by thick curtains; there does not appear to be any trace of the metallic sounds so prevalent in most large current microphones. In order to get an idea of the range of variation the instrument was tested against a Bell telephone transmitter of equal resistance with a single dry cell in circuit, and the comparison was favorable to the liquid microphone. The flow during this test was measured, with the instrument in working adjustment, and showed the latter to be capable of absorbing an energy of more than 250 watts. This has since been surpassed, and the latest model gives every indication of reaching 500 watts.

Tests have been carried out under peculiarly unfavorable circumstances with a type of generator which produced a hiss representing, probably, a ten to twenty per cent variation, and, though the hiss was preponderant over the speech, light tapping with a wisp of thin paper was loudly reproduced. It is hoped that there will shortly be an opportunity for testing this instrument in combination with an arc form of "silent generator," when good results will be expected.

The development of the invention is not yet mature, and further simplifications and capability are expected, but sufficient experience has been gained to permit of the construction of reliable instruments by those who regard the wireless telephone for skilled operation with favor.

Suggestion for Telephone Letters

A suggestion comes from a postal official in Kansas City, based upon the plan in general use by the telegraph companies of telephoning messages for the purpose of expediting their delivery, where the distance is long enough to make time a factor. The Kansas City suggestion is that a similar plan might be carried out by the government in the postal service. A certain stamp would designate a "telephone letter" and when such a stamped letter reaches the post-office, instead of a special delivery, it is to be opened and its contents read over the telephone to the addressee.

As the suggestion says, the length of such letters would have to be limited. But why wouldn't their use be of advantage to the public? A delay of several hours attends the delivery of letters in the residence district of cities. The "telephone letter" would be a sort of intermediary between the mail and the telegraph service. There would be plenty of occasions for its use.

Knowledge of the mail service might interpose fatal objections, but the proposal seems worth considering.

Telephone Company Leases Tree

A certain fir tree on a high bank on the Lewis river in Washington, has been leased for a period of fifteen years, to be used as a telephone pole, the consideration being $10. In case the tree dies, or is in any manner destroyed, the telephone company has the right to erect a real telephone pole to keep the wires above navigation in the stream.

The owner and leaser of the tree is Mrs. Mary Bratton, who leased the tree to the Etna Telephone Company. She further granted privilege to put up guy wires to the tree.

This unusual telephone pole is described as being on the North Fork of the Lewis river.

Of Interest to the Trade

Book Reviews

HOW TO READ TELEPHONE CIRCUIT DIAGRAMS, by David S. Hulfish. When an expert speaks, it behooves the uninformed, and the misinformed, to stop, look, and listen. D. S. Hulfish is an expert on telephone circuits—some say he knows more about the subject than any man in the country—and he has written a book on telephone circuit diagrams, telling how to read them. It is the work of a man who knows his subject inside and outside, and upside down, and the calm confidence of his method is encouraging, not to say inspiring. The ability to grasp the meaning of telephone circuits from their diagrammatic representation is of inestimable service to a telephone man, no matter what his particular line of work may be, and here is a book that will educate the novice, freshen the memory of the has-been, and tell even the expert something he does not know. There are 257 pages of text all written in a lucid style, and the pages are illustrated with 570 symbols and specimen diagrams, starting with the simplest and working up to the most complex. Some of the later ones are enough to stump Sherlock Holmes; but starting at the beginning and mastering details as they come, the end shows up clear as daylight. The book is as much fun as a detective story, and much more profitable.

Published by Electricity Magazine Corporation. Bound in cloth, price $1.50.

SOLENOIDS, ELECTROMAGNETS AND ELECTROMAGNETIC WINDINGS, by Charles R. Underhill, is a book of 333 pages with index, devoted to an elaborate and detailed treatment of solenoids, electromagnets, and electromagnetic windings. Since nearly all the phenomena encountered by electrical engineers in connection with the relations between electricity and magnetism are involved in the action of electromagnets, it would seem that this book ought to be of wide application. The author has expanded the knowledge of the past pertaining to the subject and added many principles and data deduced from his own experience. The matter is put as nearly as possible in chronological order, so that the book serves as a history of the evolution of the solenoid and kindred electromagnets. The pages are profusely covered with drawings, diagrams, tables, and mathematical demonstrations. The work aims to be a complete treatise on a large and important subject, and will be welcomed by the electrical profession, and also by manufacturers of apparatus.

Published by D. Van Nostrand Company. Bound in cloth, price $2.

THE TELEGRAPHIC TRANSMISSION OF PHOTOGRAPHS, by T. Thorne Baker (Constable and Company, London, publishers) appears to be the first complete book ever written on this interesting subject. Others have dealt with it in print, but their descriptions have been confined almost entirely to the pages of technical journals, and such articles have generally described only one system. There are many systems, as the present book apprizes us, and the author's purpose has been to make his readers familiar with all, from the earliest, known as the Bakewell system, to the very latest, which involves wireless telegraphy. Picture telegraphy is a peculiar mixture of electricity, optics, and photo-engraving; and an intense desire on the part of the public to get the very latest news, and to have it illustrated, seems to open up a wide field for the new science. The book consists of about 150 pages, embellished with many diagrams and half-tone cuts.

WIRELESS TELEPHONES, by J. Erskine-Murray, is written for the lay person who desires to gain a general idea of a very technical subject. Something of the development and present status of radiotelephony are indicated, with brief descriptions of the essential apparatus. Mathematical and the deeper theoretical considerations have been disregarded, not perhaps very wisely in all cases, for the simplicity of the treatment may lead readers to infer that the processes of radiant transmission are far simpler than they actually are. The nature of the electromagnetic medium has not even been mentioned so far as we can discover. Surely a few pages should have been devoted to a subject which is the very *crux* of the whole matter. The author has been content to deal with superficials, and his little book of 66 pages will doubtless answer the needs of many persons who are seeking only a superficial knowledge.

Published by the Norman W. Henley Publishing Company, New York. Bound in cloth, price $1.00.

TELEPHONE HANDBOOK, by H. R. Van Deventer, is devoted to the promotion, organization and construction of telephone lines and systems, and the maintenance of telephone apparatus. Much information of a specific and practical nature has been condensed into 127 pages, and copiously illustrated by cuts and diagrams. Special attention is given to pole line construction and to the installation of small switchboards. The style is concise and emphatic, presenting facts in a comprehensible manner. The book ought to be a useful adjunct to the field equipment of telephone workers.

Bound in paper, price 50 cents.

HISTORY OF THE TELEPHONE, by Herbert N. Casson. The telephone is now taken for granted by everybody, as one of the common accessories of daily life, and people seldom stop to remember that less than half a century ago the telephone was a thing unknown. This device which we find today so useful, so indispensable, was in the days of our grandfathers not even existent as a dream. The first telephone instrument was demonstrated by Bell, at the Philadelphia centennial; today, thirty-five years after, there are ten million instruments in use, and wires cover the earth like a mass of cobwebs. This speedy growth is so remarkable as to be almost in the nature of romance, and it is not strange that Herbert N. Casson, when writing the history of it, should have dropped into romantic language. A rhapsodical style was almost demanded in order to do justice to the subject. The author aimed to make the book interesting to the average reader and he has admirably succeeded. It is not a book for experts and men who are "in the game"; it is a surface history, intended for the general public. As such, technical matters and theoretical considerations have been

almost completely ignored, and this was to be expected. Mr. Casson, however, has ignored or slighted other phases of the subject that really came within his province. The European telephone systems have been dismissed with a contemptuous wave of the hand, without even taking the trouble to give accurate information. And the independent movement in America is slurred in a manner that gives rise to the suspicion of a calculated animus. We hesitate to charge Mr. Casson with special pleading, however, and attribute these delinquencies to the enthusiasm of the rhapsodist who can see only one side of a subject at a time. The book in all honesty should be called a "History of the Bell Telephone Company in America," for that is really the subject. It is a large subject, and Mr. Casson has made it interesting and vivid.

Published by A. C. McClurg and Company, Chicago. Bound in cloth, price $1.50.

Edison: His Life and Inventions, by Frank L. Dyer and Thomas Commerford Martin. It is generally the custom to wait until a man is dead before writing his biography, but that rule applies to men of small caliber. Edison is too big a man to be measured by one biographer, many books will be written about him, and they might as well begin to come now while the interest is hot. Edison's life is, at the age of sixty-two, by no means completed, for he is still working and achieving with undiminished activity, but he has already left behind him a mass of achievement which demands classification and summary in order that the world may understand and admire. This function the present biographers have admirably performed.

There are in the two volumes twenty-nine chapters and several appendices, the major part of which is devoted to Edison's various scientific achievements and inventions. The man is viewed consistently throughout in the light of his work. The first five chapters deal with Edison's formative period, his pedigree, boyhood and youth; then follow some seventeen chapters devoted to the various special channels of Edison's activity. These chapters follow a chronological order as far as possible, in view of the fact that each chapter is complete in itself. The final chapters deal with Edison as viewed from the social, economic and psychological standpoints; and the very full appendix deals once more with Edison's inventions, this time on the purely technical side. The volumes are written so entertainingly and afford such a just and complete survey of the life and work of a great man, that the reading of them accrues both to one's profit and pleasure.

The work has been prepared with the active cooperation of Edison himself, and the pages are loaded with a wealth of reminiscence and comment coming at first hand from the lips of the great inventor. This gives an autobiographical flavor that adds to the many virtues of the book.

Published by Harper & Brothers. Two volumes, bound in cloth, price $4.00.

Two new telephone lines between London and Paris are being opened for public service and two more are promised in the spring. With the new lines in operation around 400 conversations per day can be transmitted between the two capitals.

Improved Branch Exchange Switchboard

Efficiency is an essential factor in modern business and is largely dependent upon the amount of time necessary to convey information between the different departments, and from one business house to another. The telephone is unquestionably the quickest means of communication for such purposes. The most effective way of applying the telephone in a business concern too large for an intercommunicating system is through a telephone private branch exchange system.

Today every modern hotel, apartment house, hospital, club and business establishment has a private system of communication. Some idea of how this branch of the telephone business is growing can be had by comparing the increase in the city of New York. In 1900, New York City had a total of 1,050 p. b. x. switchboards, with a total of 12,650 stations, while in 1910 this number had grown to 11,960 switchboards, with 162,560 stations.

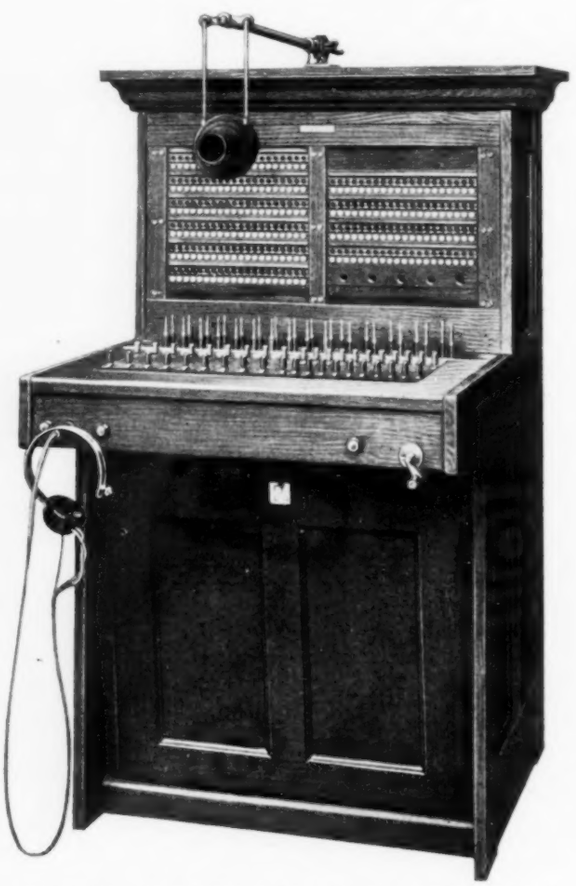


Fig. 1.—No. 1301 Switchboard for P. B. X. Capacity, 100 Lines.

To meet this rapidly growing demand, the Western Electric Company has placed on the market a complete line of private branch switchboards consisting of over thirty different types, and now has a board for every condition met with in this service.

This line of switchboards embraces both single and double position desk and cabinet patterns, in capacities ranging from 60 to 600 lines. Two general types are offered, namely, those employing lamp line

signals and those employing magnetic line signals. While both of these types are supplied, the general demand seems to indicate that the lamp signal board is becoming more popular each year.

One of the features of this lamp signal equipment is the plug ended trunk circuits. Ordinarily these trunk circuits terminate at the main exchange on the regular subscriber's line equipment and at the private branch exchange in cords and plugs. The trunk circuits in Western Electric branch exchange switchboards are wired in such a manner that connections may be made either with a common battery or magneto main office. Some advantages of this trunk circuit are:

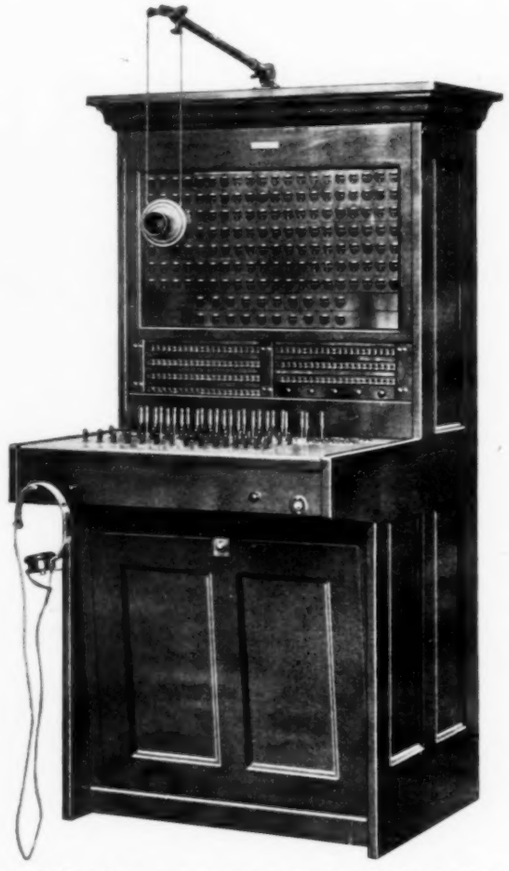


Fig. 2.—Cabinet Type Lamp Signal P. B. X. Switchboard, 200 Lines.

1. Fewer cord circuits.
2. Forty-eight volt transmission possible.
3. Incoming calls from main office completed directly.
4. Increased transmission efficiency because trunk is plug ended.
5. Individual line can be established to main office without interfering with other circuits on the board.
6. Trunk circuit can be arranged as charging trunk when specified.

These switchboards are practical in every detail, readily accessible for inspection, and present a neat and pleasing appearance. They are the result of engineering experience extending over thirty-three years and represent the highest development in branch exchange equipments.

All subscriber lines and trunks are terminated in a connecting rack, which in the cabinet type of sections is located directly under the roof. The roof is provided with a piano type hinge, which allows it to be raised as shown in the cut, rendering the connecting rack readily accessible. In the desk type switchboards the connecting rack is located in the rear of the desk, so that by removing one of the panels it is easily reached. The connecting rack is equipped with screw terminals, which permits the attachment of line wires without the use of any tool other than a screw-driver. This feature, together with the special guides which are provided, permits the exchange line to be brought in either as braided-rubber wire or as switchboard

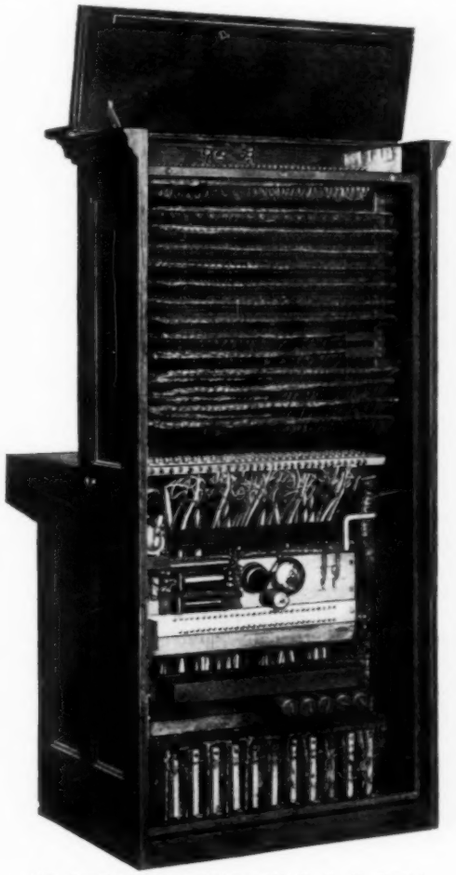


Fig. 3.—Rear View of No. 1281 P. B. X. Board.

cable, and in either case it presents a neat appearance.

The circuits of these branch boards are arranged so that they may be operated by current supplied by means of a battery of dry cells from a local telephone central office, or by its own isolated power plant. Complete power plant equipment can be furnished when desired.

The desks and cabinets are built of quarter-sawed oak, finished in a deep golden oak, or of birch, finished in mahogany. Either of these finishes presents a pleasing appearance and will harmonize with the furnishings of any room.

In the Berlin telephone exchanges phonographs are being installed for the purpose of making the responses: "Busy," "Out of order," etc.

Panel Boards and Cabinets

When a manufacturer succeeds in getting a carefully prepared and attractive catalogue of his products into the hands of prospects his advertising campaign may be said to have been successful. For winning sympathetic attention is, after all, the limit of honest advertising.

Advertising is the letter of introduction. Whether or not a sincere regard develops rests with the personality of the stranger, and, just so, merit of wares is the basis upon which volume of sales must depend.

The Crouse-Hinds Company has issued one of the handsomest and most complete "letters of introduction" ever addressed to the electrical trade—one that may well serve as an inspiration to agents and others who handle its wares. This "letter" is in the form of a 9 by 12 catalogue devoted to panel boards and cabinets. The book is profusely illustrated in two colors and printed on heavy coated white paper, the 80 pages of catalogue being inclosed in an artistically embossed cover with cloth back.

The copper, slate, black enameled steel and grained wood parts of the different articles illustrated are shown in striking fidelity of detail and coloring. Color is also used to good effect in the rule work, the soft shade employed being a relief from the solid black and guiding the eye unconsciously across or down the tabulated pages.

Each detail of construction is described tersely, and listings and prices of individual and assembled parts are presented so clearly that no reason can be found for a misunderstanding.

Panels and cabinets also are listed separately and together, which is a convenience appreciated by contractor and jobber alike.

In fact, the entire catalogue, aside from its artistic qualities, is as near perfection in orderly arrangement and presentation of facts as can well be attained. From cover to cover it reflects many months of intelligent and conscientious labor devoted to its production, and is the worthy representative of a concern noted for the excellence of its products. Any one in a position to make use of this catalogue can secure a copy by addressing a request to the Crouse-Hinds Company, Syracuse, N. Y.

Magneto Telephone Sets and Accessories

The Western Electric Company has just issued bulletin No. 1116, describing magneto telephone sets and accessories. This bulletin has been compiled for the purpose of bringing to the attention of telephone companies and telephone users in general the features of Western Electric standard magneto wall and desk sets, together with accessories.

The bulletin contains forty pages and is profusely illustrated with photographs. Several pages are devoted to the design and construction of wall and desk sets, and the No. 1317 type wall set is described with attention to the smallest details. This is the telephone set on which $10,000 was spent in designing before the first model was approved, and it is this set which has gained the enviable record of a quarter-million of sales in twenty months. The No. 1317 telephone has been made the standard for service on thousands of rural lines and in the circuits of mines and railroads, both steam and electric.

A double page cut shows the characteristic features of this telephone. The bulletin describes and lists backboards, batteries, battery boxes and gauges, binding posts, buzzers, condensers, cords, desk set boxes, desk stands, flexiphones and flexiphone arms, generators and generator boxes, gongs and gong mountings, hand sets, induction coils, number plates, protector, protector blocks, fuses, micas and mats, receivers, ringers, switch hooks, test sets, transmitters and transmitter arms and brackets.

Stromberg-Carlson's "Phoney Bill"

PHONEY BILL SAYS:

I'm strong for Indepenedent Telephony. Some politician said, "In Union there is Strength," and it's the truth.

Looks like there will be a regular round-up at Chicago this year. Am I going—well, I'm on my way.

Commercial Motor Car Show

A comprehensive display of motor trucks, delivery wagons and self-propelled road machines for all sorts of industrial purposes is to be held in Chicago during the week of February 6 to 11 next. It will follow immediately after the annual automobile show and will occupy the same building and be conducted by the same management, under the auspices of the National Association of Automobile Manufacturers.

Fully two months before the date for the opening of the show all the available space in the Coliseum and Coliseum Annex had been engaged by exhibitors, and it is possible that the fifty commercial motor vehicle concerns that have already taken space may be increased to sixty or more before February 1, and necessitate the use of the First Regiment Armory to accommodate the overflow exhibits.

It is estimated that upwards of 200 different models of work vehicles will be displayed, representing a value of more than half a million dollars. In addition the gallery and second floor of the Annex will

be filled with 150 industrial displays of parts, fittings and supplies pertaining to the motor car.

Power vehicles suitable for almost every kind of industrial and commercial business will be shown, from tricar parcel carriers for the quick delivery service of laundries, haberdashers, boot and shoe stores, confectioners, and other retailers of light goods, to ponderous motor trucks of five tons load capacity or more. There will be light and heavy delivery wagons, express wagons, baggage wagons, mail transfer wagons, light and heavy trucks from one ton capacity up, with open platform, stake, slat and covered bodies. Special forms for unusual purposes will be displayed, such as self-propelled chemical and hose carts for fire fighting, trucks with power winches operated by the motor that propels the vehicle for loading and unloading heavy pieces of machinery and boxes, crates, and barrels; trucks with self-dumping bodies for handling building materials, ashes, etc.; self-discharging coal trucks, patrol wagons, ambulances, sight-seeing cars, and motor stages.

Thousands of motor trucks and delivery wagons are now in regular daily service in hundreds of different lines of manufacture and trade, and are doing the work quicker, better and more economically than it can be done by horses or in any other way. The forthcoming show offers an excellent opportunity for the business man to get posted upon just what these machines are accomplishing, how they have been improved in recent years and how they are helping their users to build up trade and decrease expense and trouble. At the show, where the various makes are gathered together under one roof, each can be compared readily with the others, and the representatives from the factories who have made a study of trucking and delivery problems as they have a bearing on the motor vehicle can be met and interviewed.

Western Electric Company Finances

President H. B. Thayer of the Western Electric Company, in a communication to stockholders, states that for the fiscal year ending December 31, directors have voted to declare an extra cash dividend of two per cent, payable December 31 to stock of record December 24. This, with the regular eight per cent dividend makes ten per cent for the year and gives the American Telephone Company as owner of eighty per cent of the $15,000,000 stock, additional income of $250,000.

Due to the change in date of the fiscal year from November 30 to December 31, the company has declared a dividend of 1⅓ per cent payable December 31 to stock of record December 24, covering the two months of November and December, or two-thirds of the quarter which formerly ended January 31. Hereafter quarterly dividends will be paid March 31, June 30, September 30 and December 31.

In order to give time for preparation of annual report, date of the annual stockholders' meeting has been pushed forward to the first Thursday in April.

The financing which Western Electric has just arranged through Lee, Higginson & Company, is in reality a piece of refunding. The $5,000,000 4½ per cent two-year notes have been called for payment January 1 next at 100½ and long-term bonds sold to provide funds for redemption of the notes.

When the notes are paid off and the bonds delivered Western Electric will have no debt except these $15,000,000 five per cent bonds.

Lee, Higginson & Company, who are offering the bonds, will give preference on allotments so far as possible to holders of the 4½ per cent notes. It is understood that practically all note holders are making the exchange and indications are that the issue will be largely oversubscribed.

Western Electric officials state that this sale of bonds completes all new financing which Western Electric will put out for many years. President Thayer estimates that Western Electric could easily handle fifty per cent more business without additional financing and that funds received from recent sales of idle Chicago real estate will provide money enough to build any additional plants needed.

The Diamond Catalogue

Beginning with the new year every up-to-date telephone engineer or construction manager should avail himself of one of the Diamond Expansion Bolt Company's catalogues in order to enable him the more easily to select the special Diamond specialty which he is sure to require sooner or later in his work of hanging cable, locating wall telephones in city buildings, cable and block distribution, cable racking in manholes, drilling brick work and numerous other operations.

Catalogue No. 282 is prepared especially to meet the wants of the busy telephone man, being so arranged as to enable him to select just what he desires in the shortest possible time. The catalogue is supplied with an illustrated index which gives the page number, name of the article and picture of it, followed by a detailed description which is illustrated, and tables of dimensions and prices.

The Ericsson Manufacturing Company has produced a pamphlet to "Hand Mike's Pretty Sister, being a bad ballad full of veiled references to the Ericsson breast plate transmitter." Such of the booklet as is not verse is devoted to descriptions of the company's products.

The company has also issued a beautiful calendar for 1911, which is bound to please everyone who is fortunate enough to get one.

Because the copy and the cuts arrived at the same time, the article in the December TELEPHONE ENGINEER, entitled "Illinois Central Extends Telephone System," was illustrated with two cuts properly belonging to the article in this number entitled "Telephones on Electric Railways." To avoid printing the same pictures twice the illustrations are omitted in this number.

The Stromberg-Carlson Telephone Manufacturing Company is sending out a series of little envelope-size circulars illustrating and describing its different products.

A beautifully designed "appreciation" card appropriate to the season cheered the Company's friends around Christmas time.

Brevities of the Business

PERSONAL NOTES.

Adolph Emil Weber, well known to western telephone men, died recently of typhoid fever at his home in Guthrie, Okla. Mr. Weber was born in Cleveland, Ohio, January 21, 1876. Few persons have been more accurately identified with telephone developments of the past fifteen years. Mr. Weber's early telephone training was acquired in his native city, after which he held responsible positions with the Southwestern Telephone Company of Texas and still later with the engineering inspection department of the Western Electric Company in Chicago. Five years ago Mr. Weber entered the independent field and became state representative of the Kellogg Switchboard & Supply Company in Oklahoma and New Mexico, which position he held uninterruptedly until his death. His talents were freely exercised for the benefit of his customers and many modern independent plants throughout Oklahoma stand as monuments to his ability. Weber's was a rare disposition and his judgment was such that, though on the job, no one can recall having seen him provoked or out of humor. Mr. Weber was a Scottish Rite Mason, also a member of the Benevolent and Protective Order of Elks. He likewise belonged to the United Commercial Travelers and was a member of the Church of Christ Scientist. He leaves a wife, four sisters and a brother, who, with a host of friends throughout the country, mourn his untimely death.

Victor L. Crawford, familiarly known to the trade as "Happy" Crawford, whose likeness adorns this column, has been appointed eastern representative for W. N. Matthews and Brother, of St. Louis. Mr. Crawford will make New York his headquarters, and has opened offices in the Glackner building, 227 Fulton street. He has been in the employ of Matthews and Brother for five years, and is one of the best known electrical salesmen east of the Missouri river, and north of the Mexican gulf. His genial nickname was earned by his perpetual smile, the kind that won't come off. The eastern trade, which has known Mr. Crawford so long and so well, will be glad to welcome him to its midst. His happy personality and unusual ability will doubtless be of great benefit to the house of Matthews in that quarter of the country. Every little while New York needs an injection of Western energy and push like that possessed by "Happy" Crawford, in order to keep things going down there. The Great White Way will make a brilliant setting for that happy "Happy" smile.

Simon Baer, aged 63, organizer of the Atlanta Telephone and Telegraph Company, died at a sanitarium in Atlanta, Ga., December 4, of Bright's disease. Mr. Baer was identified with many large industrial and mercantile enterprises in the state.

A. V. Keyes, who has been manager for the Oroville (Cal.) system of the Pacific States Telephone and Telegraph Company since last summer, has been appointed special agent for the company, with headquarters at Chico. He is succeeded by J. W. Whitlock of San Francisco.

J. C. Buchanan has been appointed district manager of the suburban district of Atlanta for the Southern Bell Telephone Company, succeeding R. L. Boyd, who has been appointed district manager at Albany, Ga. Both Mr. Buchanan and Mr. Boyd are well known telephone men and have been associated with the Southern Bell Company for a number of years.

T. R. Gentry has been transferred from the office of the vice-president and general manager of the Southern Bell Telephone Company to Charlotte, N. C., where he will be chief clerk of the North Carolina and South Carolina division of the company.

George Traeger has been installed as manager of the Crawford County Telephone Company, at Denison, Iowa.

Henry L. Dillon has been appointed manager of the Shreveport (La.) telephone exchange. Mr. Dillon is a former resident of Toledo, Ohio.

Mr. L. L. Hill, of Page and Hill, Minneapolis, visited the office of Telephone Engineer recently, and reported progress in the cedar pole business.

T. Barton Baird, formerly manager of the Cumberland exchange at Monroe, La., has been promoted to Shreveport, where he will manage the local system. Mr. Baird is succeeded at Monroe by A. J. Thomas, who was transferred from the office at Crowley.

J. J. Kelly of Ludington, Mich., has been appointed district and local manager of the Cadillac district for the Michigan State Telephone Company.

J. S. Murdock, who for the last year has been manager of the Bell telephone exchange at Parsons, Kan., has been appointed to succeed J. A. Graves as manager of the Joplin (Mo.) exchange.

William E. Jones has been appointed manager of the Maryville (Mo.) telephone system and will supervise the extensive improvements now going on.

C. F. Phillips, former superintendent of the public utilities in Nevada, Mo., has accepted a position in the construction department of the Kinloch Telephone Company at St. Louis.

C. E. Stinson, of Buffalo, a prominent telephone engineer, died suddenly in Spartansburg, S. C., about December 8. He had been engaged on an appraisal of the Bell telephone plant in that city. Mr. Stinson was a native of New York, and has many notable achievements to his credit.

F. L. Leonard, manager of the Pioneer Telephone Company at Chickasha, Okla., has been promoted to the managership of the Shawnee office. He will be succeeded by Manager Baker of Sayre, Okla.

Lewis K. Webb, district superintendent of the East Tennessee Telephone Company, with headquarters in Knoxville, will on January 1 become manager of the Louisville-Metropoliton exchange of the Cumberland Telephone & Telegraph Company.

T. W. Ward, district commercial manager for the Southwestern Telegraph and Telephone Company, has removed from Dallas, and opened offices in Amarillo. Amarillo within the past year has assumed great importance with respect to long distance telephone service, and the placing of Mr. Ward here by the company evidences this fact to a very thorough degree.

E. H. Egan, former manager of the Independent telephone exchange at Denton, Ohio, has been promoted to the position of district manager with headquarters at Gainesville. He is succeeded at Denton by T. F. Johnson, formerly of Lancaster.

L. L. McMakin, formerly of Midlothian, Texas, has been made manager of the Clarksville exchange of the Southwestern Telephone Company, succeeding John Bell, who will be transferred to Paris within the near future.

Fred Blocksidge, commercial manager of the Wallace (Idaho) offices of the Bell Telephone Company, has received notice of his promotion to the office of district commercial manager, with Wallace as headquarters. He will have charge of all Bell business east of Wallace and west to Cataldo.

W. S. Henley, of Savannah, formerly manager of the Southern Bell Company's exchange at Newport News, Va., has taken charge of the Waycross (Ga.) exchange.

A. M. Beardsley, for six years past, the efficient district manager of the American Union (Home) Telephone Company, at Carlisle, Pa., has been promoted to the position of district manager of the Philadelphia division, with offices at West Chester.

Harry E. Dunham, for the past two years associate editor of the Telegraph and Telephone Age, New York, has resigned to accept a position as assistant examiner in the United States Patent Office, Washington, D. C.

C. F. Mason, commercial engineer of the Pacific Telephone & Telegraph Company, has been transferred from San Francisco to Los Angeles, where he will hold the position of District Commercial Superintendent.

Mr. Thomas W. Wilkinson has resigned his position in the

plant department of the Missouri and Kansas Telephone Company at Kansas City, Mo., to accept a position as superintendent of the Emporia Telephone Company, Emporia, Kas.

Mr. R. L. Lewis, district manager of the Pacific Telephone and Telegraph Company, at San Diego, Cal., has resigned to engage in other business. He has been succeeded by Mr. J. E. Franklin, of Los Angeles.

Mr. Lloyd Espenschied, of the Telefunken Wireless Telegraph Company, New York, is now with the engineering department of the American Telephone and Telegraph Company, New York.

M. C. Rorty, former manager of the Pittsburg division of the Bell Telephone Company of Pennsylvania, has been promoted to a position in the office of H. B. Thayer, vice-president of the American Telephone and Telegraph Company, New York. Mr. Rorty is a graduate of Cornell University and entered the telephone service in 1897. He has held important posts with the telephone companies in New York, Boston and Pittsburg.

CONVENTIONS.

The Nebraska Independent Telephone Association will hold its annual meeting at Lincoln, February 7 and 8.

The South Dakota Independent Telephone Association will hold its annual convention at Redfield, January 11 and 12.

The National Independent Telephone Association will hold its annual convention at Chicago, January 17, 18 and 19.

NEW TELEPHONE COMPANIES.

DELIGHT, ARK.—A charter has been granted the Delight Telephone Company, incorporated by W. H. Bowers, R. W. Stell and B. M. Parsons and capitalized at $1,000. It will be located at Delight.

CARROLLTON, GA.—The Gainsboro Telephone and Telegraph Company has been chartered by the secretary of state, with $250,000 capital.

ALLERTON, IOWA.—The Allerton Telephone Company has been chartered, with capital stock $10,000; incorporators, W. T. Grimes, R. Z. McCoy, B. Bracewell and others.

WAVERLY, IOWA.—The Washington Rural Telephone Company, capital stock $6,000, has been incorporated by H. O. Steege, John J. Becker, Herman Brandt, W. C. Steege, F. H. Meyer and A. F. Sauerbrei.

ASHVILLE, KY.—The Citizens' Telephone Company filed articles of incorporation. The capital stock is fixed at $3,000. The purpose for which the company was organized is to operate and to conduct telephone lines in Jefferson and Bullitt counties.

HUGHESVILLE, MO.—Articles of incorporation of the Hughesville Trunk Line Telephone Company, have been filed. The capital stock of the company is $1,500.

SULLIVAN, ILL.—The Sullivan Telephone Company has been incorporated with a capital of $70,000.

CANNELVILLE, OHIO.—The Cannelville Telephone Company has been incorporated by John H. Swingle and others, with capital of $10,000.

MACEO, OHIO.—Maceo Home Telephone Company, capital stock, $500, has been incorporated by D. G. Bright, George M. Taylor and B. W. Hames.

WASHINGTON, C. H. OHIO.—A mutual telephone company has been organized by the farmers living in the vicinity of Mt. Sterling. It will connect with the Bell Company for long-distance service.

ELM GROVE, OHIO.—Elm Grove Telephone Company, capital stock $1,000, has been incorporated by J. R. Hale, R. W. Owen and W. Futrell.

SASSAMANSVILLE, PA.—A charter has been granted the Douglass Telephone Company, which has a capital of $5,000.

CUMBERLAND VALLEY, PA.—The Valley Stock Telephone Company has been chartered with $5,000 capital stock.

BUMPUS MILLS, TENN.—State Line Telephone Company, Stewart county, capital $5,000, has been incorporated by W. B. Pugh, D. Hargis, S. L. Hargis, Edison T. Fentress, C. R. Crow. The company proposes to build a line from Bumpus Mills to Cadiz, Ky.

SALT LAKE CITY, UTAH.—Articles of incorporation of the People's Telephone Company of Millard county, which has for its purpose the building up of an inter-county independent public utility system, including telegraph, telephone and general messenger service, through southern Utah, has been filed. The originators of the company are A. M. Roper, who is president; Leo Lyman, who is vice-president, and J. Greathouse, who is secretary and treasurer. The capital stock is fixed at $10,000.

CLAY, WIS.—The Viking Telephone Company, capital $1,000, has been incorporated by H. Johnsrud and others.

MICHICOT, WIS.—The Michicot Telephone Company, capital $2,600, has been incorporated by A. Holst and others.

FREEMONT, WIS.—The Fremont Telephone Company, capital $7,000, has been incorporated by G. H. Dobbins and others.

ELK CREEK, WIS.—Elk Creek Telephone Company, capital $8,000, has been incorporated by W. A. Warner, Luke Roskos, A. M. Thompson.

BRAGGS, OKLA.—Braggs Telephone Company, capital $1,000, has been incorporated by A. C. Clark, G. C. Breedlove and Claud Hamilton.

NARDIN, OKLA.—People's Mutual Telephone Company, capital $5,000, has been incorporated by N. Goin, I. S. Arnold, J. W. Coffelt and others.

CARROLLTON, GA.—The Gainesboro Telephone Company, capital $250,000, has been incorporated by J. C. Bass, L. Mandeville, L. K. Smith and others.

YADKINVILLE, N. C.—The Yadkinville Telephone Company, capital $6,000, has been incorporated by W. L. Hudspeth and others.

DALLAS, TEXAS.—With a paid up capital of $500,000, the Dallas Automatic Telephone Company has been incorporated at Austin. The list of directors includes prominent Dallas capitalists and the statement is made that further work on a local system will be done immediately.

HARRISBURG, IDAHO.—The Harrisburg Telephone Company has been incorporated with a capital of $10,000. The incorporators are Frank Finney, E. L. Gallagher, L. D. George and A. Bolander.

TACOMA, WASH.—Articles of incorporation have been filed with the county auditor by the Mt. Tacoma Telephone and Telegraph Company, capital stock $3,000. The trustees are A. E Dye, Isabella Dye and Charles C. Biggs.

SPOKANE, WASH.—The Washington Consolidated Telegraph and Telephone Company, capital $1,000,000, has been incorporated by Fred Howes of Burlington, Vt., H. H. Reynolds of Peterboro, N. H., and C. M. Cooley of Spokane. It is proposed to acquire holdings of a number of smaller telephone companies in this vicinity.

SAN FRANCISCO, CAL.—The Sanitary Telephone Mouthguard Company has been incorporated by G. A. Moore, J. L. Gould, J. L. Miller, G. H. Bandry, F. A. Brown, E. R. Blake, R. P. Rogers, J. W. Scott and F. R Grother, with a capital stock of $300,000.

ELKADER, IOWA.—The Bordman and Wagner Telephone Company has incorporated with a capital stock of $1,000.

FOREMAN, ARK.—The business men of Foreman have organized a telephone company, with a capital stock of $5,000. Following are the officers of the company: A. Goldsmith, president; John H. Hawkins, secretary and treasurer; A. J. Kizer, general manager; A. B. Killian, local manager.

ROME, N. Y.—As soon as the Rome Home Telephone Company can secure a suitable site they propose to erect a fireproof building.

CONSTRUCTION NEWS.

CANON CITY, COLO.—The Colorado Telephone Company has appropriated $25,000 for the improvement of its system in Canon City. Work has begun and will continue with a large force of men for at least four months. Cables will be installed throughout the residence district of the city and vicinity to supersede the open wire system now in vogue.

CENTRALIA, ILL.—The Central Union Telephone Company contemplates extensive improvements to its system here.

ALTON, ILL.—The Bell Telephone Company plans improvements costing $50,000 for the system here.

DUNDEE, ILL.—The Interstate Telephone Company is planning many improvements in its lines here for this winter and next spring.

VALLEY JUNCTION, IOWA.—The Iowa Telephone Company will commence immediately the erection of a modern telephone exchange building at Valley Junction.

HAGERSTOWN, MD.—A company will be organized to build a rural telephone line from Greencastle to State Line along the Middleburg road.

CALUMET, MICH.—The Michigan State Telephone Company will have a large crew of men in Calumet put to work on the extension of lines into Keweenaw county and the branching out of the service in the district north of Calumet.

ST. LOUIS, MO.—The Bell Telephone Company will erect a three-story exchange at 6210 Delmar avenue, costing $33,000. The new exchange will handle business in the West End district.

MARYVILLE, MO.—The Missouri and Kansas Telephone Company is planning a number of extensive improvements on its plant here, and when completed should make the Maryville branch one of the best equipped exchanges in this vicinity. The proposed improvements will cost in the neighborhood of $40,000, say company officials.

PLAINS, MONT.—The Rocky Mountain Bell Telephone Company plans to build a new line starting from St. Regis through Paradise to Plains. Later it will be extended to Thompson.

ROME, N. Y.—The Rome Home Telephone Company plans to spend from $50,000 to $65,000 on construction work, including a new building.

BUFFALO, N. Y.—Two million dollars has been appropriated by the New York Telephone Company for extensions and improvements in Buffalo.

SYRACUSE, N. Y.—The Bell Telephone Company will spend $75,000 in Syracuse next year. The $75,000 is Syracuse's portion of a $600,000 appropriation for Central New York improvements, provided for in a 1911 budget, which has been provisionally approved by the executive committee of the New York Telephone Company.

CLEVELAND, OHIO.—The Cleveland Telephone Company will make an eight-story addition to its plant, costing $100,000. The building will be ready for use in the spring.

VALE, ORE.—Extensive improvements are being made in Vale by the new owners of the Malheur Home Telephone Company. The papers of incorporation, just filed, show that the company is incorporated at $75,000 and that it is the plan to purchase all telephone lines in the county. The exchanges at Ontario and Nyssa have already been secured.

CRESCENT CITY, ORE.—With the completion of the Pioneer Telephone Company's line from LaPine to Crescent announcement is made by the company that within a short time the line will be further extended to Silver Lake.

VERA CRUZ, PA.—The Vera Cruz Telephone Company bought a part of the Atlantic and Delaware telephone lines and will soon extend its services to Limeport, Hosensack and Pennsburg.

JOHNSTOWN, PA.—The Johnstown Telephone Company will spend $15,000 in installing its own lines in the field formerly reached by an arrangement with the Windber independent company. The latter company has switched its traffic to the Bell company.

COMMERCE, TEX.—The Commerce Telephone Company has begun the reconstruction of a large part of its system and will make several miles of extensions in the different parts of town. The work will cost over $3,000.

BROWNSVILLE, TEX.—Extensive improvements are contemplated here by the Southwestern Telephone Company. These include both local and long-distance lines.

DEL RIO, TEX.—The Del Rio and Western Telephone Company is now installing improvements to its plant, which will cost over $5,000.

CARSON, VA.—The Tri-State Telephone Company will put in an up-to-date switchboard at Carson in the near future and will give their subscribers the best service possible.

QUANAH, TEX.—Division Superintendent J. F. Henderson of Fort Worth has perfected arrangements with the city of Quanah whereby the Southwestern Telegraph and Telephone Company will install what is commonly known as common battery system, covering the city and adjacent territory. The improvement carries with it an expenditure of about $12,000. The patrons have consented to a slight advance in rates.

WILKES-BARRE, PA.—The Bell company will expend about $100,000 improving the system here during the next few months.

COLFAX, IOWA.—The erection of the new telephone exchange in this city has been started. The structure is to be modern in every way. The two telephone systems in the city will consolidate in the spring.

INDIANAPOLIS, IND.—The Central Union Telephone Company is placing two new branch exchanges in this city, both of which will be in operation next spring. One will be known as the "Circle" exchange and the other will be known as "West."

CUTHBERT, GA.—The Cotton Belt Telephone Company, of which C. J. O'Farrell is general manager, contemplates issuing $100,000 of bonds for the purpose of improving and extending its system.

HAMILTON, MONT.—The Rocky Mountain Bell Telephone Company will commence the immediate installment of additional equipment at an estimated cost of $12,000.

MUNCIE, IND.—The Delaware and Madison Counties Telephone Company has begun the expenditure of $25,000 or more on the improvement of its property in Muncie and the toll lines running out of the city. New toll lines will be built this winter to Newcastle, Gaston and Alexandria.

AUSTIN, TEXAS.—Announcement has been made that the local service of the Southwestern Telephone Company will be materially improved within the next few months. Extensions and improvements are also planned at San Antonio.

TRENTON, MO.—The Bell Telephone Company will expend about $50,000 in improvements on the local exchange.

FINANCIAL ITEMS.

LINCOLN, NEB.—The York County Telephone Company has been authorized to issue $50,000 of capital stock. The Platte County Telephone Company has withdrawn its application to issue $58,000 of capital stock. It will issue a lesser amount later.

BUXTON, N. D.—The Red River Valley Telephone Company has voted an increase of capital stock from $100,000 to $200,000.

SCOTTSVILLE, OHIO.—Settle and Gainesville Telephone Company is increasing capital stock from $7,500 to $17,500.

HURON, OHIO.—Huron Telephone Company, capital stock increased from $10,000 to $40,000.

CROSS PLAINS, OHIO.—The Farmers' Mutual Telephone Exchange Company will increase capital stock from $911 to $10,000.

IRONTON, OHIO.—The capital of the Home Telephone Company has been increased from $50,000 to $120,000, to take over the plant of the Bell company here.

SALT LAKE CITY, UTAH.—There will be filed in the office of the secretary of state an amendment to the articles of incorporation of the Utah, Nevada and Idaho Telephone Company, providing for an increase in the capital stock of the company from $200,000 to $600,000. The object of the increase is to provide funds for the necessary extensions, principally throughout the state of Nevada.

FRANCHISES ASKED AND GRANTED.

DE KALB, ILL.—The city council has granted a twenty-five year franchise to the Exchange Telephone Company. There are two telephone companies already operating in this community.

SALMON CITY, ORE.—The Lemhi Telephone Company has been granted a franchise to put in a telephone system in Salmon City. This will give the town two telephone systems, as the Redrock and Salmon River Telephone Company has been in operation here for several years.

PORT ARTHUR, TEX.—The Southwestern Telephone and Telegraph Company asked for a thirty-year franchise to do local business in this city at a meeting of the city council. The Southwestern service here is exclusively long-distance. The local field is covered by the South Texas Company.

NACOGDOCHES, TEX.—At a meeting of the city council a franchise was granted the Nacogdoches Telephone Company to erect poles and an office in this city. The purpose of the new company is to supply the rural districts with telephones.

SLOAN, IOWA.—A franchise has been voted to the Woodbury Telephone Company.

NAPERVILLE, ILL.—The city council has granted a twenty-five-year franchise to the Inter-State Telephone Company, which provides that after ten years from January 1, 1911, the company shall pay the city five per cent of the gross rental earnings.

MISCELLANEOUS.

CLARKSVILLE, ARK.—The Southwestern Telegraph and Telephone Company has purchased the independent exchange at Clarksville. The property is to be improved and the line extended to rural communities in every direction from Clarksville.

plant at Sullivan, Ill.

SULLIVAN, ILL.—Messrs. Ed. Sterrett and C. C. Camp, owners of the Henry telephone system, have purchased the telephone plant here.

CHICAGO, ILL.—According to present plans the Chicago Subway Telephone Company will begin operating its automatic telephone service in the down town district of the city about January 1. It is expected that the first official directory, containing names of about 5,000 subscribers, will be issued at that time. In all, the company has about 32,000 subscribers.

HENRYVILLE, IND.—The business men of this town have taken steps toward the formation of a co-operative telephone company, to run in opposition to the Cumberland system.

FERGUS FALLS, MINN.—Fire destroyed a new switchboard under process of installation here, the loss amounting to $15,000. A new switchboard will have to be constructed.

CARLYLE, ILL.—A conditional sale of the telephone system of the Citizens' Telephone and Telegraph Company of Clinton county has been made to H. J. C. Beckemeyer of this city, who has been general manager of the system for the last few months.

NORWICH, N. Y.—The Marquis Telephone Company has taken over the Oxford Valley Telephone Company, which went

into the receiver's hands some time ago and the lines will be repaired and operated to better advantage. The consideration is said to have been $6,500.

NEW YORK, N. Y.—The American Teloclean Company has been incorporated for $25,000, the purpose being to clean and disinfect telephones, etc.

MARYSVILLE, OHIO.—The Citizens Telephone Company of Delaware has sold its Ostrander exchange to the Ostrander Telephone Company, which was operating a competing system.

BUCYRUS, OHIO.—The long distance telephone business of the Bell and Independent company in this field has been combined and all long distance work will be handled by one company. The local Bell service will be abandoned gradually. The independent company will occupy the exclusive local business and the Bell company the long distance work. Owing to the installation of a new automatic service the rates of the independent company were advanced 50 per cent.

MITCHELL, S. D.—President Zietlow of the Dakota Central Telephone Company is about to make a proposition to the Mitchell city council for the installation of an up-to-date automatic telephone system.

AUSTIN, TEX.—J. E. Farnsworth, general manager of the Southwestern Telephone Company, announced that the company will spend $3,000,000 in improvement of the Texas and Arkansas lines during the next two years.

BURNET, TEX.—G. P. Lester of San Angelo has purchased the entire capital stock of the Smart Telephone system, the consideration being $5,000. This system covers Burnet and all the interior towns of Burnet county and many towns in other counties.

PROVO, UTAH.—The people of Alpine, the smallest incorporated city in Utah, are building a telephone system which will be connected with the Utah Independent Telephone system for long distance service.

NEWPORT, VT.—The Passumpsic Telephone Company will buy the Vermont People's Telephone Company for the sum of $60,000.

PARIS, TEX.—The Charleston Telephone Company, operating an independent line in Delta county, with headquarters in Charleston, has sold its lines to San Antonio and Childress parties.

KEOKUK, IOWA.—Only one bidder was present at the sale of the Mississippi Valley Telephone Company, comprising independent exchanges at Keokuk, Burlington, Fort Madison, Muscatine and a dozen smaller towns in Iowa. The property was sold at public sale by decree of Judge McPherson to satisfy a bonded indebtedness of $175,000. The property was purchased for $175,000 by Webster Brothers, brokerage firm, Minneapolis.

CADILLAC, MICH.—The Home Telephone Company's business at Thompsonville and Walli has been bought by the Bell people.

NEWCASTLE, IND.—The controlling interest in the Newcastle Telephone Company has been acquired by the Eastern Indiana Telephone Company of Winchester. The new owners announce that extensive improvements will be made and many toll lines be built to improve the local service.

MOUNT STERLING, ILL.—The stock of the Mount Sterling Telephone Company has been sold to the People's Telephone, Electric Light and Power Company for $12,000. Possession is to be given January 1, 1911. Senator W. I. Manny has been the principal promoter of the new company. The present system is to be extended and otherwise improved.

WAYCROSS, GA.—In January steps will be taken to form an independent telephone company to include several south Georgia cities. F. M. Calhoun, of Beach, is the prime mover. The Southern Bell Telephone Company announces that it will improve its local exchange at a cost of $50,000.

ELYRIA, OHIO.—A merger of the Lorain county telephone companies is contemplated. It is said the new company will soon be incorporated with a capital of $500,000.

OSKALOOSA, IOWA—Announcement is made today of the purchase by the Oskaloosa Home Telephone Company of an interest in the Albia Telephone Company. There will be reorganization of the Albia business.

KLAMATH FALLS, ORE.—With the transfer of the property of the Midway Telephone and Telegraph Company began the commencement of the installation of a new telephone system in this city which, when finished, will be one of the finest in any town of this size in the state.

MURPHY, N. C.—The Bell Telephone Company has bought out the Cherokee Telephone Company of this place.

FRANKFORT, KY.—Central Home Telephone Company, Louisville, Ky., will expend $50,000 for improvements, including installation of new equipment.

HANNIBAL, MO.—Hannibal is to have the finest telephone building in northeast Missouri, a structure three stories high and costing about $30,000. This has been decided upon as a result of a meeting of the Missouri and Kansas telephone executives, headed by Frank Lathrop of this city.

SPARTA, TENN.—Home Telephone Company (C. W. Roberts, manager), recently reported organized with capital stock of $5,000, will construct 12 to 15 miles of telephone line connecting Cookeville and Smithville, Tenn. J. W. Holladay, engineer in charge of construction.

WADESWORTH, N. C.—The Wadesworth Telephone Company is rebuilding the entire plant. New poles and new lines with a modern, up-to-date switchboard mean a considerable expenditure.

MACON, GA.—The Southern Bell Telephone and Telegraph Company has begun the reconstruction of the toll line between Eufaula, Ala., and Columbus, Ga., by way of Omaha, Ga.

TULSA, OKLA.—The Pioneer Telephone and Telegraph Company has begun work on an underground conduit system which will cover eighteen blocks and will cost close to $50,000.

SOUTH BEND, IND.—The Central Union Telephone Company's new building, which cost $100,000, and was equipped at a cost of $150,000, was formally opened October 15. Many officials of the company attended the opening.

HUTCHINSON, KAN.—The rural telephone system in Abbyville and Plevna townships is to be extended. A new line is to be built through Huntsville township, and a toll line will be extended sontheast from Abbyville. C. M. Parris has been made manager of the system, and he is having some extensive improvements and repairs made on the lines.

CUMBERLAND, IOWA—The Farmers Mutual Telephone Company here is making extensive improvements. New cables have been strung and the company is moving to a new office, more commodious than the former one.

WILMINGTON, OHIO—Engineers of the Bell Telephone Company were in Wilmington selecting the best route for a new and direct telephone line from Wilmington to Cincinnati.

MURPHY, N. C.—The Southern Bell Telephone and Telegraph Company has bought out the Cherokee Telephone Company of this place. This property consists of instruments and something like 100 miles of poles and wire.

ABERDEEN, S. D.—The managers of the different local offices of the Dakota Central Telephone Company met with the head officials of the company in this city to discuss the affairs of the company and plan extensions and betterments for the ensuing year. The Dakota Central is one of the oldest and largest telephone companies in the northwest, having over 400 stations in the Dakotas.

WATERTOWN, N. Y.—The New York Telephone Company, which has just secured control of the Jefferson County Telephone Company, is preparing to make plans for a large building here to accommodate both plants. Neither the Bell office nor the Jefferson County Telephone Company's plant is large enough for the business of the new company.

BRADY, TEXAS—J. J. Paxton has sold a one-half interest in the Brady telephone exchange to his brother-in-law, C. A. Fancher. Mr. Paxton says that about $12,000 will be expended on the system, and that the work will be completed within sixty to ninety days.

LEBANON, OHIO—Many improvements are about to be made by the Valley Telephone Company, which contemplates erecting a handsome new building and an underground system of wires. If tentative plans mature properly, Lebanon will have one of the finest telephone systems in the state.

GALLIPOLIS, OHIO—The Gallipolis telephone system has been bought from Receiver Cyrus Huling of Columbus by E. L. Coan of Vermillion, Ohio, for $14,450.

NAPOLEON, OHIO—An order for the sale of the property of the Napoleon Home Telephone Company was entered October 19 by the Common Pleas court. The sale will be conducted about December 1, according to Ralph Brown, receiver. A receivership was established when the company defaulted interest on $50,000 bonds held by the Cleveland Trust Company.

OMAHA, NEB.—The Telepost company, which recently opened an office in Omaha and connected this city by telepost with Louisville and Indianapolis and several intervening cities, now announces that extensions to New York are under way and Omaha can soon telegraph to New York and New England at a flat rate, regardless of distance.

NEWARK, OHIO—The Newark Telephone Company will at once erect a modern two-story fireproof building. Several weeks ago the Newark company was granted a franchise to build and operate an automatic telephone exchange in Newark, and by April 1 the new system will be in operation.

TULSA, OKLA.—The Pioneer Telephone Company has commenced work upon a conduit system which as planned will be adequate for a city of from 50,000 to 100,000 inhabitants. The Pioneer Telephone Company is erecting a five-story building which will be occupied almost exclusively by that company for its offices here. This building is costing $100,000 and will be completed by January 1.

MINNEAPOLIS, MINN.—James Leck has been awarded the contract for the telephone exchange building which the Northwestern Telephone Exchange company will build at 3748 Pillsbury avenue, at a cost of $25,000.

SUMMERVILLE, GA.—The Southern Bell Telephone and Telegraph Company, is just now completing the equipment and installation of a new central exchange at a cost of $60,000.

MEDICINE HAT, ALTA.—The Alberta Southeastern Telephone Company, operating lines from Medicine Hat to Cypress Hills, has received an offer from the Provincial Government for the purchase of the line, which will probably be accepted.

NORFOLK, VA.—The Southern Bell Telephone and Telegraph Company is planning the construction of a six-story exchange building and the installation and equipment at Norfolk; total cost of improvements to be $200,000 including a $70,000 switchboard.

HENDERSONVILLE, N. C.—The Southern Bell Telephone and Telegraph Company will, about the first of the year, install practically a new exchange in the town of Hendersonville.

LANCASTER, N. Y.—The new telephone company has plans prepared for improving its service here. An appropriation of $32,000 has been made to cover the contemplated improvements.

DENVER, COLO.—Denver soon will have connection by telephone with several cities of Texas, including Fort Worth, Dallas, Dalhart and Childress, according to a statement issued at the headquarters of the Colorado Telephone Company. New lines have been completed between Santa Rosa and Tucumcari, N. M., a distance of seventy miles, and from Tucumcari the line will soon be extended to Amarillo, Texas.

COLUMBIA, LA.—The Cumberland Telephone Company will put in a complete local system in the town of Columbia, and will extend their wires to all rural districts, including Kelly, Clarks, Grayson, Mount Pleasant, Vixen, Cotton Plant, Holum and Copenhagen.

HAMPTON, IOWA—The Iowa Telephone Company is getting material on the ground here for a new exchange building, 36x22 feet, two-story with basement. Equipment to be for common battery in order to consolidate the Central of Iowa and Iowa Bell exchanges, the latter having obtained control of the Independent company during the past summer.

LIVINGSTON, *Mont.*—The State Telephone and Telegraph Company opened a new automatic exchange in this city, August 27. The occasion was celebrated in a festive manner by prominent people of the town and state.

ABERDEEN, WASH.—Including the laying of underground cables in the business districts of the city; the enlargement or entire reconstruction of the present office building; the installation of a complete new switch board system of the latest pattern and extensions in outlying districts, the Pacific States Telephone and Telegraph Company has laid plans for the next year which call for an expenditure of close to $90,000 and when completed will have resulted in practically the entire rebuilding of the equipment.

CARLINVILLE, ILL.—B. M. Burke, president of the Carlinville Telephone Company, states that his company is preparing to rebuild its exchange at Litchfield. A new modern brick exchange building will be erected, the outside plant completely overhauled and rebuilt and common battery equipment will be installed. Nothing will be left undone to give Litchfield complete modern telephone service. The Carlinville Telephone Company is one of the oldest sublicensees of the Central Union Telephone Company.

OAKLAND, CAL.—Papers have been filed in the Superior Court indicating that the Home Telephone Company of Alameda county has combined with the Home Telephone Company of San Francisco, the new corporation receiving the title of the Bay Cities Home Telephone Company. The consolidation, which, although financed by the same men, had hitherto been entirely separate organizations, is significant as indicating the beginning of a determined campaign on the part of the new company for more business around the bay. Under the scheme of reorganization expenses will be cut and a more efficient and wider range of service is promised over the automatic telephone.

MCALESTER, OKLA.—The telephone girls of the Pioneer Telephone Company operating all over the state, recently held a convention in this city. The delegates were girls holding the more important positions, such as the chief operators, long-distance operators, etc. Two or three such meetings are held each year under the auspices of the company, the purpose being the instruction of employes and the betterment of the service in general.

GREAT FALLS, MONT.—The Bell Telephone Company's new line to Havre was opened recently. Toll stations have been provided at Box Elder and Big Sandy. The new line is built of No. 12 copper wire and is considered to be as near perfect as good material and experienced workmen can make it. Eventually it is the intention of the company to extend its lines farther east until the Dakotas are "within hearing distance."

MISSOURI VALLEY, IOWA.—An arrangement has been reached whereby the Iowa Bell Telephone Company will take care of the rural telephone lines of Missouri Valley and will install a modern system with metallic lines to meet the farmers. The farmers will also lease their franchise which the city granted them at their last meeting, to the Bell Company.

BILLINGS, MONT.—The Interstate Consolidated system, with which the Billings Automatic Telephone Company has recently become associated, is planning several immediate extensions and improvements which will materially increase the long distance facilities of the Independent interests in Montana. President Lane announced that a copper-metallic extension from Great Falls to Conrad is to be built at once to connect with the recently acquired Drake properties at Conrad, Chouteau, Valier and Cut Bank, together with a new long distance line from Great Falls to Vaughn. This latter line will give the southern part of this section long distance facilities north to Brady and Conrad and an outlet from Conrad to Great Falls and all other points on the system. Work on the newly purchased Big Blackfoot Telephone Company, which extends from Drummond to Ovando and Helmville and which taps one of the richest sections of the state also is being rushed. This system will soon have an exclusive connection with the general Independent system at Drummond.

KEOKUK, IOWA.—The Mississippi Valley Telephone Company, operating exchanges in Minneapolis, Burlington, Ft. Madison and Keokuk, is on financial rocks. The entire property is to be sold at public auction Sept. 26, 1910, at Keokuk to satisfy a mortgage of $180,000 executed in 1901 at 5 per cent and on which only the first three semi-annual installments of interest have been paid.

CHICAGO, ILL.—The report of the Chicago Telephone Company for the month of August shows installation of 4,709 new instruments, removal of 2,339, and net gain of 2,370. In the eight months of 1910 total installations have numbered 45,960, against 39,884 in the correspondidng period of 1909, a gain of 15.2 per cent. Fewer instruments have been removed and the net gain for this period has been 23,332 against 17,489 last year, a gain of 33.5 per cent in additions. The total number now in service in the city and suburban districts of Chicago is 285,691, a gain in one year of 37,022 or 14.9 per cent.

MACON, MO.—At a recent meeting of the council the mayor's veto of a twenty-year local and long-distance franchise to the Bell and Macon Telephone companies was overruled and both ordinances passed. This is a culmination of a year's fight to keep the Bell out of the local service field. The Bell people have agreed to put up a system costing from $70,000 to $80,000 within eight months after the passage of the ordinance.

KANSAS CITY, MO.—The Missouri and Kansas Telephone Company has recently installed a roof garden on the Central exchange, where fifty to seventy-five girls can rest. Chairs, tables and reading racks will be provided and an ideal rest room result.

BURNS, TENN.—Efforts are being made to build a telephone line from Petway to White Bluff. The farmers are agreeing to aid in the matter. It is understood that there will be an effort made by the Independent Telephone Company to secure the line, though the Cumberland people are putting up a stiff bid for it.

BELOIT, WIS.—The Beloit Home Telephone Company is being reorganized, the stock that has been held in Beloit heretofore going to the Bell Company. The local men holding directorships will continue in office two years longer, however, under an old contract with the Bell Company. Alfred Slater, local manager for some years, will be transferred to work for the Bell Company in Milwaukee, and the new manager for Beloit has not yet been named. The company plans to erect a new building and install a new central system soon.

SPRINGFIELD, OHIO.—The Central Union Bell Telephone Company will add to the general rebuilding boom in the city. They are now receiving material for extensive repairs and extensions to their outside plant, as well as an increase in the capacity of the switch boards.